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NOTES ON PHILIPPINE ORCHIDS WITH DESCRIPTIONS OF
NEW SPECIES, I.*

By OAKES AMES.

(From the Ames Botanical Laboratory, North Easton, Mass., U. S. A.)

It has been suggested by Dr. Fritz Kränzlin that the species of *Dendrochilum* which I have assigned to the section *Acoridium* ought to constitute a distinct genus. Dr. Kränzlin asserts that the form of the labellum is quite distinctive in *Acoridium* on account of its likeness to the letter E. When I studied *Dendrochilum tenellum* in the preparation of Fascicle I of "Orchidaceae" I felt strongly that it belonged to a genus entirely distinct from *Dendrochilum* because of the absence of stelidia from the column and of the peculiar subfiliform leaves. Since then I have been convinced by a study of more material that *Acoridium* belongs to *Dendrochilum*. In the first place, the E-formed labellum on which Dr. Kränzlin lays emphasis is only characteristic of a majority of the species of the section *Acoridium* and is not found in *D. turpe*, *D. oliganthum*, *D. hastatum*, *D. Merrillii* and *D. ocellatum*, which clearly belong to the section. In the second place the lack of stelidia in the species of § *Acoridium* is not a wholly satisfactory differentiating character between it and § *Platyclinis*. It is not satisfactory because the lack of stelidia expresses a condition which is approached by well-defined species of *Dendrochilum* such as *D. palawanense* and because *D. Merrillii* in which the stelidia are absent from the column is in every other respect a well-marked species of *Dendrochilum* § *Platyclinis*. Furthermore, there is no habitual distinction by which to separate the species of *Acoridium* from *Dendrochilum*. The linear leaf characteristic of *D. tenellum*, *D. sphacelatum*

* Proof corrected by E. D. Merrill and C. B. Robinson.

and *D. luzonense* passes into the broadly lanceolate leaves of *D. Merrillii* through such species as *D. graminifolium*, *D. tenuifolium*, *D. turpe* and *D. philippinense*. The calli on the labellum of *D. tenue*, *D. parvulum* and *D. venustum* are not characteristic of *Acoridium* as a whole and consequently are worthless in the consideration of generic segregation. After eliminating the characters which I have named there is nothing further, in my opinion, which may be reasonably regarded in an attempt to form a distinct genus with the species of § *Acoridium*.

Through an unfortunate oversight on the part of Dr. Kränzlin, who completed the *Coelogyninae* for "Das Pflanzenreich," left unfinished by Dr. Pfitzer, the titles on my plates of *Dendrochilum* species were overlooked. These plates were practically duplicates of the set prepared for Fascicle II of "Orchidaceae," and were loaned to Dr. Kränzlin to facilitate his work on species which I had recently described. I believed that Dr. Kränzlin would understand from the legends on the plates that in my forthcoming volume *Acoridium* would be displaced by *Dendrochilum*. As it turned out Dr. Kränzlin failed to observe the change in my work indicated by the plates and as a result an unlooked-for controversy ensued in which Dr. Kränzlin insisted¹ that the plates loaned to him were inscribed with the generic name *Acoridium*. Here again Dr. Kränzlin erred, as a subsequent examination proved the correctness of my assertion to the effect that the loaned plates were inscribed with the generic name *Dendrochilum*. Dr. Kränzlin's work preceded mine, for which the plates were prepared, and consequently the changes in "Orchidaceae" Fasc. II, which were made at the end of the introduction were necessary. Dr. Kränzlin himself directed my attention to his unfortunate oversight.

DENDROCHILUM Bl.

D. (§ *Acoridium*) *pulogense* sp. nov.

Pseudobulbi congregati, pyriformes, in sicco rugosi plus minus 1 cm longi, juniores vaginis subacutis mox in fibras solutis inclusi. Folia acuta vel obtusa, linearia, 2-7.5 cm longa, circa 2 mm lata. Petiolus pergracilis. Pedunculus gracilis, filiformis, 4-10 cm longus. Bractee inflorescentiae glumaceae, pedicellum brevem et ovarium multo excedentes. Inflorescentia laxiflora. Flores 6-10. Rhachis vix flexuosa. Sepala lanceolata, acuminata, acuta, 1-nervia, circa 3 mm longa plus minus 1 mm lata. Petala sepalis similia, ovata vel rotundata, valde acuminata, 1-nervia, 3 mm longa. Labellum 3-lobatum, lobi laterales membranacei semicrescentiformes, obtusi, lobus medius tridentatus. Calli 3, unus ad basim lobi lateralis utriusque, unus in medio partis saccatae labelli. Columna minuta, columnae *Dendrochili tenelli* similis.

This species is represented in the herbarium of the Bureau of Science by two collections, both of which were made by the same collectors on Mount Pulog.

¹ Orchis 2: 78.

develop. This characteristic is frequently misleading and not unlikely to cause confusion. The leaves of the specimens from Luzon measure 6.5 cm in length and 1.5 cm in width.

The collector's notes state that the plants were found at an altitude of 1,400 m and that the flowers are white and fragrant and very ornamental.

DENDROBIUM Sw.

D. hymenanthum Reichb. f. in Bonplandia 3 (1855) 222; Walpers Annales Botanices Systematicae 6: 302.

This very rare species which was among the novelties secured by H. Cuming (no. 2135) in the Philippine Islands has been twice collected by the botanists of the Bureau of Science. It is closely related to *Dendrobium Micholitzii* Rolfe (cf. Ames Orchidaceae 1: 41, pl. 11). The stems are yellow, about 8 cm long, quadrangular, very slender, bifoliate at the summit, with the oblong-elliptic leaves 2-3.5 cm long, 8 mm wide. The flowers, which are borne at the summit of the stem, are fragrant; the mentum is tinged with "purple" outside. Pedicels slender, subfiliform, about 2 cm long. Lateral sepals triangular, acute, prolonged into a stout, curved, obtuse mentum; from tip of sepals to tip of mentum 16 mm long. Upper sepal lanceolate, 7 mm long. Petals similar to the upper sepal, but narrower, 5 mm long. Labellum about 2 cm long, somewhat oblanceolate, dilating gradually from the cuneate base to the rounded, 7 mm wide apex; near the apex is a small crest of short, yellowish hairs.

The director of the Royal Botanic Gardens at Kew has very kindly compared my material with the Cuming specimen preserved in the Kew Herbarium and has assured me that the specimens collected by Ramos are conspecific with the Cuming plant.

Montalban, Province of Rizal, Luzon, W. Schultze, May, 1908, *Bur. Sci.* 5610; Maximo Ramos, July 29, 1907, *Bur. Sci.* 3035. According to Ramos the flowers last a very short time.

NOTE.—From an excellent photograph which accompanies the plants collected by Ramos it appears that the flowers are produced singly at the summit of the stem.

D. epidendropsis Kränzlin in Orchis 2 (1908) 79, fig.

The material which I have identified as *D. epidendropsis* was collected by W. S. Lyon (no. 118). Although a native of the Philippine Islands the exact locality from which Mr. Lyon's plant came is not known. Mr. Lyon flowered it in his garden in November, 1908. He described the flowers as greenish-yellow, coriaceous in texture, wax-like, and both within and without glossy as if varnished. A single leaf, and what appears to be an undersized stem and three flowers constitute the specimen at hand. The leaf is oblong-lanceolate, 7 cm long, 1.5 cm wide, subcoriaceous. The stem is fusiform, clothed with several scarious sheaths, at the summit is a short raceme, 2 cm long, which bears three 3 cm long flowers. The flowers are conspicuous because of the long subfalcate mentum which is 2 cm long and about 3 mm in diameter.

In the herbarium of the Bureau of Science there are three specimens which agree with my interpretation of *Dendrobium epidendropsis*. Two of these were collected on Mount Mariveles, Province of Bataan. The third specimen was taken in the Province of Rizal.

Lamao River, Mount Mariveles, Province of Bataan, Luzon, growing on trees on exposed ridges, at an altitude of 900 m, flower odorless, lip bright, pale-green, als pale-green with 3 or 4 brown stripes from base to tip, December 10, 1904, E. Borden, *For. Bur.* 2109; near same locality, on trees, flowers yellow with

specimen in the Gray Herbarium seems to me to be of very great interest and value.

Mount Banajao, Laguna Province, Luzon, very common on trees, flowers yellowish-green, November 10, 1907, H. M. Curran and M. L. Merritt, *For. Bur.* 8019; at an altitude of 2,000 m, November 10, 1907, Curran and Merritt, *For. Bur.* 8034; at an altitude of 1,400 m, November 10, 1907, Curran and Merritt, *For. Bur.* 8023, 8021.

D. strictiforme (Ames) Pfitzer in *Das Pflanzenreich* 32 (1907) 116.

This species was first discovered by Elmer D. Merrill between Suyoc and Pauai in Benguet Province. The present specimen was collected in Laguna Province.

Mount Banajao, Laguna Province, Luzon, at an altitude of 1,400 m. flowers white, November 1, 1907, H. M. Curran & M. L. Merritt, *For. Bur.* 8024.

D. cinnabarinum Pfitzer in *Das Pflanzenreich* 32 (1907) 104; Ames *Orchidaceae* 2: viii; 3: 10, *pl.* 27, II, B, b.

This very interesting species of the *Dendrochilum pumilum* group has again been found. Messrs. Curran, Merritt and Zschokke collected specimens at an altitude of 2640 m, January 5, 1909, on Mount Pulog, Province of Benguet, Luzon, *For. Bur.* 16348. Until the rediscovery of the species *D. cinnabarinum* was only known through the specimens gathered in Benguet by A. Loher (no. 461).

CESTICHIS Pfitzer.

C. nutans sp. nov.

Pseudobulbi 3 cm longi, pyriformes. Folia oblonga, acuta, 3 dm longa, 2-3 cm lata. Sepala 7 mm longa, 3 mm lata. Petala linearia, 7 mm longa, 0.5 mm lata. Labellum cuneato-flabellatum, 8 mm longum, prope apicem 8 mm latum, callo ad basim. Columna arcuata, 6 mm longa.

C. nutans is a robust species, allied to *C. Merrillii*, with oblong acute leaves which are considerably longer than the winged scape. The raceme is slender and nutant. The flowers according to the collector's notes are brick-red. The labellum is cuneate-flabellate in outline, 2 mm wide at the base, and near the point of union with the column very fleshy, and somewhat channelled.

Camp Keithley, Lake Lanao, Mindanao, May 1907, *Mary Strong Clemens* s. n.: Province of Surigao, April 6, 1906, *F. H. Bolster* 289. Here also belongs the plant collected on Mount Victoria, Island of Palawan, in March, 1906, by F. W. Foxworthy. *Bur. Sci.* 638.

ANGRAECUM Thou.

A. philippinense Ames in *Philip. Journ. Sci.* 2 (1907) Bot. 336; *Orchidaceae* 2: 246; 3: 69, *pl.* 50.

This species which was originally collected on Mount Halcon by E. D. Merrill, has been found at Imogen, Province Nueva Viscaya, Luzon, where H. M. Curran collected specimens on December 22, 1908, *For. Bur.* 10860. The flowers of the plant collected by Curran have spurs or nectaries about 10 cm long. A comparison between the plants from Luzon and those from Mindoro clearly proves that the spur of the type was not fully developed on the date of collection. This statement is sufficient to account for the discrepancy between the measurements given above and those published in the original description. It is a well established fact that the spurs in orchids increase in length as the flow

No. 16342 was found at an altitude of 2,500 m, and according to the notes made by the collectors had flesh-colored flowers. The foliage of no. 16347 is very variable, (only one plant of no. 16342 was found), so much so that at first glance two distinct species appear to be mingled. *Dendrochilum tenue* (Ames) Pfitzer and *D. parvulum* (Ames) Pfitzer are very close affinities of *D. pulogense*.

Mount Pulog, Province of Benguet, Luzon, January, 1909, *For. Bur.* 16347 (type), 16342 Curran, Merritt & Zschokke.

D. (§ *Acoridium*) *auriculare* sp. nov.

Pseudobulbi congregati, longitudinaliter rugosi, subpyriformes, circa 2 cm longi, juniores vaginis subacutis mox in fibras solutis inclusi. Folium cum petiolo 1–2 dm longum. Lamina 6.5–13 cm longa, 1.5–2.7 cm lata, oblongi-lanceolata, acuminata, acuta vel subobtusata. Petiolus gracilis, 1.7–6 cm longus. Pedunculus subfiliformis, multo folium excedens, plus minus 2 dm longus. Bracteae inflorescentiae glumaceae, pedicellum brevem et ovarium multo excedentes. Flores in racemo laxo dispositi, albi. Sepala lateralia ovato-lanceolata, 3-nervia, 7 mm longa, 4 mm lata. Sepalum superius oblongum vel oblongi-ellipticum, 7 mm longum, 3.5 mm latum. Petala rotundato-elliptica vel rotundato-ovata, 6.5–7 mm longa, 4.5–5 mm lata, 3-nervia. Labellum 4.5 mm longum, 3-nerviū, 3-lobatum; lobus medius subreniformis, lateralibus major, 3.5 mm longus; lobi laterales auriculares, 1.5 mm longi, inter eos in disco labelli callus magnus. Columna sectionis, circa 2 mm longa.

In general aspect *Dendrochilum auriculare* suggests *D. Hutchinsonianum* Ames, although analysis of the flowers shows clearly the differences between the two species. The lateral lobes of the labellum in *D. Hutchinsonianum* are distinctly linear-falcate, while in *D. auriculare* they are auriculate, much reduced in size and much shorter than the middle lobe (cf. *Orchidaceae* 2: 96, fig.). *D. auriculare* is one of the largest-flowered species of the *Acoridium* section.

Province of Benguet, Luzon, December, 1908, Maximo Ramos, *Bur. Sci.* 5818 (type). Mount Ugo, Province of Benguet, December 17, 1908, Maximo Ramos, *Bur. Sci.* 5771. Collector's note.—“The color of the flowers is nearly white.”

D. *venustum* (Ames) Pfitzer in Das Pflanzenreich 32 (1907) 116.

Mount Ugo, Province of Benguet, Luzon, December, 1908, Maximo Ramos, *Bur. Sci.* 5840. This species was originally described as *Acoridium venustum* in the Proceedings of the Biological Society of Washington 19 (1906) 147 and later illustrated in *Orchidaceae* 2: 88. It is apparently a rare species as the specimens gathered by Ramos are the only ones, with the exception of the type material, which have been collected for the Bureau of Science.

D. *philippinense* (Ames) Pfitzer in Das Pflanzenreich 32 (1907) 118.

A very odd form of this species has come from the Lusod-Bayabas trail, Province of Benguet, Luzon, which appears to have smaller flowers than the type. At first I felt no little hesitation in identifying the plants as *D. philippinense*. As all the racemes examined exhibit the peculiarity referred to I have prepared the following description.

Lateral sepals lanceolate, acuminate, acute, about 3.5 mm long, 1.5 mm wide; upper sepal oblong, acute, 3 mm long, about 1 mm wide. Petals acute, 3 mm long, 1.75 mm wide. Labellum 3-lobed, the lateral lobes equaling the middle lobe, linear falcate, about 1 mm long, middle

lobe broader than the laterals, middle lobe oblong, rounded, acute at the apex, 1 mm long, 0.75 mm wide. At the base of each lateral lobe there is a minute rounded callus. Column typical of the section.

The flowers are fleshy and most difficult to dissect as the sepals and petals break under very slight pressure. The labellum is thick and has a conduplicate middle lobe. No comments by the collectors have been made regarding the color of the flowers but in dried specimens those near the base of the raceme are brownish with the labellum yellow, those near the apex yellow. Although the racemes appear to be perfectly normal, flowers have the appearance of keeping partly closed so that even the old ones look like buds. The texture of the flowers is extraordinary and unlike that of any other known species of the genus from the Philippine Islands.

Province of Benguet, Luzon, December 16, 1908, altitude 2,000 m, *For. Bur.* 15763 Curran & Merritt.

D. ocellatum (Ames) Pfitzer in *Das Pflanzenreich* 32 (1907) 117.

This species, the type of which is represented by a small plant in the herbarium of the Bureau of Science, has been again collected by Bacani. The flowers exhibit the same hyaline dots from which the specific name was derived. These dots are in the form of minute protuberances which give the sepals and petals a verruculose character. According to the collector's notes the flowers are brown.

In the top of a mango tree, Lusod, Province of Benguet, Luzon, December 14, 1908, *For. Bur.* 15908 Bacani.

D. bicallosum Ames *Orchidaceae* 2 (1908) 117.

This species was originally collected in Mindoro by Elmer D. Merrill at an altitude of about 950 m on Mount Halcon. On October 23, 1907, Curran and Merritt obtained material in Laguna Province, Luzon, which I unhesitatingly refer to *D. bicallosum*. The leaves of several of the specimens from Luzon are longer and broader than those of the Mount Halcon plants, in several being nearly 2 dm long and 5 cm wide. Otherwise there are no conspicuous differences although the plants from Luzon are more luxuriant, a character which may be accounted for by more favorable conditions for growth.

Mount Maquiling, Laguna Province, Luzon, at an altitude of 550 m, in ridge forest; flowers brownish-yellow, October 23, 1907, *For. Bur.* 7797 Curran & Merritt.

D. pumilum Reichb. f. *Bonplandia* 3 (1855) 222.

Specimens which agree almost perfectly with the Cuming plant in the herbarium of the British Museum of Natural History numbered 2102, the number on which Reichenbach f. founded *D. pumilum*, have been collected in Laguna Province, Luzon, by Curran and Merritt. *Dendrochilum pumil.* is placed among the doubtful plants in the Pfitzer-Kränzlin monograph in Engler's "Pflanzenreich" without reference to the specimen of the type number in the British Museum. From my studies I have been unable to discover any sufficient reason for a total disregard of the evidence which this specimen furnishes. An interesting sidelight on the subject is supplied by a single plant in the Gray Herbarium which was collected in the Philippines by the Wilkes Expedition. This plant is inadequate for a sure diagnosis although it clearly belongs to *Dendrochilum* and is probably conspecific with *D. tenue* Pfitzer. In Reichenbach's handwriting it has been referred with a query to *Dendrochilum pumilum*! Together with Reichenbach's original description and the specimen in the British Museum, the

specimen in the Gray Herbarium seems to me to be of very great interest and value.

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NOTE.—From an excellent photograph which accompanies the plants collected by Ramos it appears that the flowers are produced singly at the summit of the stem.

D. epidendropsis Kränzlin in Orchis 2 (1908) 79, *fig.*

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a tinge of red, November, 1904, *A. D. E. Elmer* 6839: Province of Rizal, Luzon, November 23, 1907, Maximo Ramos, *Bur. Sci.* 3060.

NOTE.—The specimens collected by Elmer and Borden have stems up to 2 dm long and narrowly lanceolate leaves, 1.3 dm long, 1–1.9 cm wide. The flowers of the specimen collected by Elmer are, in a dried state, strongly tinged with purple and resemble large flowers of *Dendrobium secundum*. The racemes on all the specimens examined appear to have been few-flowered.

D. Dearei Reichb. f. in *Gard. Chron.* 52 (1882) 361.

MINDORO, January, 1908, *For. Bur.* 8525 Merritt.

D. (§ Aporum) Merrillii Ames *Orchidaceae* 2: 181, fig.

In *Orchis* 2: 96, Dr. Kränzlin in a review of "Orchidaceae Fasc. II," criticises rather severely my description of *Dendrobium Merrillii* and suggests that to me the genus *Dendrobium* is a seven-sealed book. His reason for this unkind remark is based on the words "Folia . . . conduplicata, explanata 14 mm lata." By these words he understands that *D. Merrillii* is a species with broad leaves and consequently inadmissible as a member of § *Aporum*. Unfortunately the word "explanata" is misleading, although it was intended to indicate that the leaves if spread out would then measure 14 mm in width. As a matter of fact the leaves are characteristic of § *Aporum* and resemble the leaves of such species as *D. atropurpureum* Miq. and *D. sagittatum* J. J. Smith. In his criticism Dr. Kränzlin has quoted from my description and has omitted the word "conduplicata" which I thought was a sufficient offset to the problematical condition expressed by "explanata." The leaves of *D. Merrillii* are in reality equitant and in the type measure 7 mm across in the vertical direction of the stem.

BULBOPHYLLUM Thou.

B. bataanense Ames *Orchidaceae* 1: 96.

Among living plants sent from Mount Mariveles this species bloomed in May, 1909, in my greenhouse. The flowers are yellowish, faintly tinged with purple and conspicuously nerved with pale-green. The sepals, especially the upper one, are sprinkled with fine purple dots. The labellum is similarly marked with the addition of a bright yellow spot at the base of the cordate apical portion. The original description of this species was prepared from dried material, consequently the color of the flowers could not be given accurately.

Mount Mariveles, Province of Bataan, Luzon, *Elmer D. Merrill*, 1905.

PHALAENOPSIS Bl.

P. Lindenii Loher in *Journ. des Orch.* 6 (1895) 103.

Among the orchids collected by W. S. Lyon is a specimen of *Phalaenopsis* which is surely conspecific with *P. Lindenii*. It agrees in every detail with the description published in "Le Journal des Orchidées." *P. Lindenii* is described as resembling *P. Schilleriana* in its foliage and as having flowers which suggest those of *P. rosea* (*P. equestris*). Mr. R. A. Rolfe has suggested that Mr. Loher's species may be a natural hybrid resulting from a cross between *P. Schilleriana* and *P. rosea* which would give *P. Veitchiana* Reichb. f. The specimen at hand is not at all in agreement with *P. Veitchiana* as figured and described in horticultural literature. The flowers are about 2.5 cm in diameter and the apical lobe of the labellum is rotund apiculate, 1 cm long by 8 mm wide. The lateral lobes are oblong, obtuse, somewhat dilated at the apex, about 7 mm long, the fleshy callus between the lateral lobes is disc-shaped when spread out. The lateral sepals are somewhat ovate-falcate, 13 mm long, 7 mm wide. The petals are spatulate, obtuse, 16 mm long, 6 mm wide.

Mr. Lyon says that the flowers are very persistent. According to his notes the anterior surface of the column and the lip are rich-purple, otherwise the perianth is light-rosy-purple, each segment marked with seven well defined lines, those on the lip continuous or uninterrupted, those on the sepals and petals broken or formed by dots. The leaves are mottled gray and green and are almost identically like those of *Phalaenopsis Schilleriana* in coloration.

In addition to Mr. Lyon's specimen I have studied three others from the Philippines which I do not hesitate to refer to *P. Lindenii*. Two of these are in the herbarium of the Bureau of Science, the third in the herbarium of the New York Botanical Garden. All of these were collected in Benguet Province, Luzon. The specimen in the New York Botanical Garden collection has larger flowers than the others, these being about 3 cm across, with the rotund apical lobe of the lip about 1.3 cm long by 1.2 cm wide. The tip of the lip is in no way divided and is not at all in agreement with the lip of *P. Veitchiana* as represented in plate 213 of the Floral Magazine. Until more material has been studied it seems best to adopt Mr. Loher's name for this *Phalaenopsis*. The specimens in the herbarium of the Bureau of Science have a branched inflorescence not unlike that of *Ionopsis utricularioides* Lindl. in general aspect, although much stouter. In Orchis (1: 82, fig. 37) this species has been very fully illustrated. The analysis of the flowers is very detailed.

Baguio, Province of Benguet, Luzon, August 24, 1906, H. M. Curran, *For. Bur.* 5121, 5122, flowers light-pink and white; October 21, 1904, R. S. Williams (no. 1947 bis) in hb. New York Botanical Garden; W. S. Lyon (no. 39).

NOTE: Mr. Lyon says the plant is called *P. Lindenii* at Manila.

AERIDES Lour.

A. Lawrenceae Reichb. f. Gard. Chron. N. S. 20 (1883) 640, 307, 368.

In Orchidaceae 2: 249, I listed this species, basing my conclusions on a specimen collected by the Rev. R. F. Black in Mindanao. This specimen was fragmentary and my identification was in a way provisional. Another specimen has come to hand from W. S. Lyon which is undoubtedly *A. Lawrenceae*. The flowers are large, about 2.5 cm in diameter and very ornamental. Unfortunately Mr. Lyon forgot the exact locality from which he obtained his specimens which flowered in his garden at Manila.

Philippine Islands, W. S. Lyon 25.

HABENARIA Willd.

H. Leibergii Ames Orchidaceae 2: 34, fig.

This species has been collected in Rizal Province by D. LeRoy Topping who found specimens in July, 1908. The type was discovered by J. B. Leiberg on Mount Mariveles in 1904. One of the specimens found by Topping shows an interesting variation from the type in its larger leaves which measure nearly 1 dm in length and 4-5 cm in width. On this luxuriant form the flowers are in a dense raceme, about 20 in number.

Montalban, Rizal Province, Luzon, July, 1908. *Bur. Sci.* 5226 Topping.

NOTES ON PHILIPPINE PALMS, II.

By O. BECCARI.

(Florence, Italy.)

ARECA Linn.

Areca macrocarpa Becc. sp. nov.

Inter majores. Folia ampla, 2.5 m longa, petiolo brevissimo crasso; segmentis numerosis aequidistantibus, valde approximatis, lanceolato-falcatis, valde acuminatis, 1-costulatis et 5 cm latis, vel 2-costulatis et subduplo latoribus; majoribus 1 m et ultra longis, superioribus sensim decrescentibus, terminalibus in flabellum non unitis. Spadices Fructus majusculi, 7 cm longi, ovoideo-elliptici, perianthio 16-17 mm alto suffulti, in medio 5 cm lati, utrinque fere aequaliter attenuati, superne conici, apice mammillaeformi et areola 5 mm lata terminati; semine e basi plana conoideo, apice obtuso, 28 mm longo, 22 mm lato.

A rather large palm, apparently of the dimensions of *A. Whitfordii*. *Leaves* large, 2.5 m long in one specimen, its petiolar part very short, strongly arched, 5 cm broad near the lowest leaflets, slightly concave above, rounded beneath; the rachis is broadly channelled above in its first or basal portion and prominently so in the median portion, and has an acute, salient angle along its center; leaflets very numerous, equidistant, very close together, almost imbricate and inserted at an acute angle, lanceolate-falcate, long-acuminate, 1-costulate and 5 cm broad, or 2-costulate and about twice as wide, the largest, those of the middle, 1 m long, and at times more; the upper gradually shorter, the ultimate ones being the smallest and not united to form a flabellum. *Spadices* *Fruits* large, ovoid-elliptic, 7 cm long, 5 cm in diameter in the middle, and thence gradually, and almost equally diminishing toward both ends, tapering at the apex to a conical point which terminates in an almost flat surface, about 5 mm in diameter. Seed conoidal, 28 mm long, 22 mm broad, having a truncate or flat base, and a blunt point; the branches of the raphe are much anastomosed and form a close net all around the seed. *Fruiting perianth* 16 to 17 mm high, with thick, coriaceous, sub-deltoid, acute sepals; the petals have a triangular dead point, sharply defined from the lower living part.

MINDANAO, District of Zamboanga, Port Banga, *For. Bur.* 9103 *Whitford & Hutchinson*, January, 1908.

Of this fine and large *Areca*, I have seen only one entire leaf, and a few fruits; these latter are even larger than those of *A. Catechu*; in fact no other species of the genus is known with such large fruits. Otherwise it seems related to *A. Whitfordii*.

Areca mammillata var. *mindanaensis* Becc. var. nov.

Differs from the typical forms growing in Palawan, especially by its fruits, which are considerably larger. It is a plant about 4 m high. *Leaves* in one specimen 1.4 m long in the pinniferous part with a petiolar part 25 cm in length; the leaf-sheath is 22 cm long. *Stem* 3 cm in diameter. Leaflets about 28 on each side, equidistant, 30 to 35 cm apart, 1-costate, but occasionally 2-costate, narrowly falcate, the intermediate ones 45 to 50 cm long, 18 to 20 mm broad, otherwise as in the type, the two terminal leaflets form a small, forked flabellum, are 4- or 5-costulate, and terminate with as many pairs of rather obtuse teeth as there are costae, these are, however, more acute than in the type. *Fruits* larger than in the type, very narrowly oblong-ellipsoid, diminishing a good deal toward both ends, about 3 cm long, 9 mm in diameter. *Seed* 13 mm long, 6.5 mm broad. *Fruiting perianth* 12 mm high.

MINDANAO, District of Zamboanga, Port Banga, *For. Bur. 9141 Whitford & Hutchinson*, in forests at about 20 m above sea level, December, 1907.

PINANGA Bl.

Pinanga geonomaeformis Becc. sp. nov.

Gracillima, sobolifera, 1.5 m alta, caudice tenuiter arundinaceo. Folia in circumscriptione oblonga, 25-35 cm longa, 11-12 cm lata, irregulariter et interrupte in segmentis paucos, utrinque 1-2, pinnatisecta; segmentis lateralibus e basi lata sensim in acumen falcatum attenuatis; inferioribus angustis, 1- vel 2-costulatis, superioribus 3-7-costulatis et 3-6 cm latis, duobus terminalibus in flabellum profunde furcatum unitis et in margine exteriori inciso-dentatis. Spadix gracillimus, indivisus, 10-16 cm longus; fructibus concinnis, exacte biseriatis, angustissimis, teretibus, saepe curvulis, 13-14 mm longis, 3 mm crassis, perianthio depresso cupulari, 3 mm lato, 1.5 mm alto, truncato et ad faucem paullo coarctatum suffultis.

A very delicate and elegant palm 1 to 1.5 m high, growing in small clusters. *Stems* very slender, 7 to 10 mm in diameter, very distinctly ringed every 3 to 6 cm; internodes slightly clavate, dotted with small orbicular tobacco-colored scales. *Leaves* pinnatisect; the leaf-sheaths finely striate and dotted like the stems and with the remains of a deciduous membranaceous ligule at their mouths; the petiole slender, 6 to 8 cm long, 2.5 to 3 mm thick, this, and the rachis are also dotted with scales; the blade is oblong, 25 to 35 cm long, 11 to 12 cm broad, thinly papyraceous, dull, and about the same color on both surfaces, irregularly and interruptedly divided down to the rachis, into a very few, unequal, alternate or decurrent segments (2 to 4 on each side), which gradually narrow from a broad base to a falcate and acuminate point; the lowest

leaflets are small, narrow and 1- or 2-costulate, those of the middle are 3 to 6 cm broad and with 3 to 7 costae, the two of the apex are more or less cleft, and acutely toothed on their upper outer margin and are united by their bases but rather divaricated, so as to form a deeply forked flabellum with a wide reëntering angle between them. *Spadix* very simple and consisting of the very flattened axis or rachis, 10 to 14 cm long, more or less pedicellate, recurved when in fruit. *Male flowers* comparatively large for the small size of the plant, irregularly angular, 10 to 12 mm long; the calyx very small; the segments of the corolla falcate, very acuminate. *Fruiting perianth* shallowly cupular or somewhat depressed, 3 mm broad, 1.5 mm high, broader at the base than at the mouth. The scars left by the fallen fruits on the rachis are relatively large, orbicular, and flat, with the lower bract small but distinct, rounded in its outline, but minutely apiculate in the center, deflexed or ringent. *Fruits* distinctly bifarious, or pectinate, about 6 mm apart and 14 to 18 in number on each side, terete with a blunt apex, very slender, often slightly curved, 13 to 14 mm long, 3 mm thick.

Luzon, Province of Tayabas, *For. Bur. 10155 Curran*, March, 1908; Province of Rizal, *Loher 7055*.

It is one of the smallest and most elegant species known, with unbranched spadices like *P. disticha*, but with pinnately cleft leaves, resembling those of some species of *Geonoma*.

***Pinanga sclerophylla* Becc. sp. nov.**

Mediocris, caudice, ut videtur, circ. 4 cm diam. Folia circiter 85 cm longa; vagina coriacea 35 cm longa; petiolo nullo; segmentis numerosis approximatis, 12-18 mm inter se dissitis, aequidistantibus, subtiliter coriaceis, rigidissimis, omnibus rectis (minime falcatis); basilaribus et intermediis unicostatis, 35-40 cm longis, 16-20 mm latis, longe et sensim acuminatis; superioribus sensim minoribus, apice obtusiusculis, interdum bicostulatis et apice obscure bidentatis, summis in flabellum profunde furcatum unitis. Spadices circiter 25 cm longi, in ramulos nonnullos irregulariter circum axem insertos divisi et parte pedicellari brevi praediti, floribus omnibus distincte 3-seriatis; ramulis fructiferis rigidis, crassiusculis, 14-17 cm longis, basi circiter 4 mm crassis, sursum parum attenuatis, plus minusve trigonis. Fructus triseriati, parvi, late ovati, apice minute apiculato-mammillati, basi (in sicco) abruptissime caudiculati, 13 mm longi, 7.5-8 mm lati, 7-8 mm inter se dissiti; semine late ovato, 8 mm longo, 6.5 mm lato, utrinque rotundato, raphidis ramis ascendentibus ad 9, quorum 3 vel 4 centralibus apicem superantibus, caeteris ad latus recurvis, omnibus laxè anastomosantibus. Perianthium fructiferum depresso cupulare, 4.5 mm latum, circiter 2 cm altum, truncatum, in ore parum coarctatum.

A rather slender plant, about 4 m high. The *stem*, judging by the size of the leaf-sheath, may be about 4 cm in diameter. *Leaves* about 85 cm long in the pinniferous part; petiole quite obsolete; leaf-sheath

coriaceous, about 35 cm long; rachis, in its intermediate portion with a very salient angle in the center of its surface, very finely punctulate under the lens; leaflets numerous, about 35 on each side, equidistant, 12 to 18 mm apart, thinly coriaceous and very stiff, dull and of about the same color on both surfaces, straight, not at all falcate or sigmoidal; those of the base and of the central part are ensiform, unicostate, 35 to 40 cm long, 16 to 20 mm broad, gradually long-acuminate, somewhat narrowed toward the base, which is 7 to 8 mm broad and with the margins bent backward; the upper leaflets shorten gradually and become less acuminate, occasionally they become bicostate, when this occurs, they are obscurely bidentate at the apex; 4 or 5 leaflets of the summit are united together and form a deeply forked flabellum; the mid-costa is very prominent above, beneath it is slender and bears a few linear scales; the secondary and tertiary nerves are rather conspicuous, and give a distinctly striate appearance to both surfaces; the margins are more or less distinctly thickened. *Spadix* about 25 cm long with several branches, irregularly inserted around the axis; the pedicellar part is short and flattened; the branches when bearing fruit are rigid, rather thick, 14 to 17 cm long, 4 mm in diameter at the base, slightly lessening upward, more or less trigonous, the flowers being distinctly arranged in three longitudinal series; the areolae left by the fallen fruits are very superficial, 7 to 8 mm apart on each longitudinal line, bordered by very narrow bracts; of these the lower has a round margin and is not apiculate in the middle. *Fruits* small, broadly ovoid, inconspicuously apiculate and mammillate at the apex, suddenly caudiculate at the base (when dry) in the portion immersed in the perianth, 13 mm long, 7.5 to 8 mm broad. *Seed* broadly ovoid, 8 mm long, 6.5 mm broad, rounded at both ends, its basal foveola, corresponding to the embryo, slightly oblique; the main vascular branches of the raphe are 9, ascendent, of these 3 or 4 pass over the top, the others bend laterally, and are slightly anastomosed. *Fruiting perianth* shallowly cupular, 4.5 mm broad, 2 mm high, truncate, and slightly narrowed at the mouth.

MINDORO, Mount Halcon, *For. Bur.* 4468 Merritt, June, 1906, altitude about 1,500 m.

Pinanga sclerophylla is evidently closely related to *P. Woodiana*, from which it differs chiefly by its very stiff, unicostate, narrower, and much more approximate leaflets, by the seed which in general is rounder in shape, and in the raphe having more numerous branches.

***Pinanga Woodiana* Becc. sp. nov.**

Mediocris, caudice, ut videtur, circiter 4 cm diametro. Folia circiter 2 m longa; petiolo . . . ; segmentis numerosis, concinne aequidistantibus, utrinque inter se 15 cm dissitis, spisse chartaceis et rigidis, elongato-lanceolatis, rectis vel vix ad apicem falcatis; intermediis bicostulatis, 55 cm longis et in medio 4.5 cm latis, sursum in acumen longiusculum rigi-

dum abeuntibus, inferne quoque nonnihil attenuato. Spadices circiter 20 cm longi, in ramulos nonnullos irregulariter circum axem insertos divisi, et parte pedicellari brevi praediti; ramulis fructiferis rigidis, crassiusculis, 12-15 cm longis, e basi fere usque ad apicem circiter 4 mm crassis, et, parte apicali excepta, trigonis. Fructus pro maxima parte 3-seriati, superne vulgo bifarii, parvi, ovoideo-elliptici, utrinque aequaliter attenuati, apice minute apiculato-mammillati, 12 mm longi, 7 mm lati; semine ovoideo, 9 mm longo, 6 mm lato, superne rotundato, basi non producto, foveola embrionali nonnihil obliqua, raphidis ramis vulgo 5, vix vel non anastomosantibus, ramo centrali tantum apicem seminis superanti. Perianthum fructiferum depresso cupulare, 3.5 cm latum, 1.5 mm altum, in ore exacte truncatum et parum coarctatum.

A rather slender plant 4 to 5 m high. *Stems* solitary, 3.5 to 4 cm in diameter, with the internodes about 4 cm long and the annular scars or rings left by the fallen leaves 12 to 14 mm broad. *Leaves* about 2 m long; petiole; rachis, in the intermediate portion, with a very prominent salient angle along the center of the upper surface, at first puberulous, later very minutely dotted (under the lens); leaflets about 25, and 5 cm apart on each side, very regularly equidistant; the medial ones bicostulate, elongate-lanceolate, straight, or very obsoletely falcate, stiff and rather thickly papyraceous, 55 cm long, 4.5 cm broad in the middle, and thence gradually narrowing upward to a rather long-acuminate rigid point, they narrow also from the lower third or fourth downward to a base which is about 1 cm broad, are dull and subconcolorous on both surfaces, slightly paler, but not glaucescent, beneath; the costæ in the upper surface are prominent and acute, in the lower rounded and bearing a few elongate scales; secondary nerves very slender, and slightly stouter than the very numerous tertiary ones; this causes the two surfaces, when dry, to be finely striate; the margins are slightly thickened. *Spadices* about 20 cm in length with a pedicellar part 3 cm long, recurved in fruit, divided into not very numerous (14 in one specimen) branches; these are irregularly inserted around the main axis, rigid, about 4 cm thick throughout, 12 to 15 cm long, more or less trigonous. *Flowers* mostly distinctly 3-seriate, the uppermost usually bifarious; the areolæ left by the fallen fruits are very superficial, 5 to 6 mm apart in each line, bordered by very narrow bracts; of these the lower are also very narrow with a round margin and not apiculate in the center. *Fruits* small, 12 mm long, 7 mm broad, red, turning dark-purple, ovoid-elliptic, diminishing equally to both ends, inconspicuously mammillate at the apex. *Seed* ovoid, 9 mm long, 6 mm broad, rounded above, not caudiculate at the base, the embryonal foveola somewhat oblique; the branches of the raphe are usually 5, ascending; of these only that of the center passes over the top of the seed, the others bend at its sides, and not at all or but very slightly anastomose. Albumen very

dum abeuntibus, inferne quoque nonnihil attenuato. Spadices circiter 20 cm longi, in ramulos nonnullos irregulariter circum axem insertos divisi, et parte pedicellari brevi praediti; ramulis fructiferis rigidis, crassiusculis, 12-15 cm longis, e basi fere usque ad apicem circiter 4 mm crassis, et, parte apicali excepta, trigonis. Fructus pro maxima parte 3-seriati, superne vulgo bifarii, parvi, ovoideo-elliptici, utrinque aequaliter attenuati, apice minute apiculato-mammillati, 12 mm longi, 7 mm lati; semine ovoideo, 9 mm longo, 6 mm lato, superne rotundato, basi non producto, foveola embrionali nonnihil obliqua, raphidis ramis vulgo 5, vix vel non anastomosantibus, ramo centrali tantum apicem seminis superanti. Perianthum fructiferum depresso cupulare, 3.5 cm latum, 1.5 mm altum, in ore exacte truncatum et parum coarctatum.

A rather slender plant 4 to 5 m high. *Stems* solitary, 3.5 to 4 cm in diameter, with the internodes about 4 cm long and the annular scars or rings left by the fallen leaves 12 to 14 mm broad. *Leaves* about 2 m long; petiole; rachis, in the intermediate portion, with a very prominent salient angle along the center of the upper surface, at first puberulous, later very minutely dotted (under the lens); leaflets about 25, and 5 cm apart on each side, very regularly equidistant; the medial ones bicostulate, elongate-lanceolate, straight, or very obsoletely falcate, stiff and rather thickly papyraceous, 55 cm long, 4.5 cm broad in the middle, and thence gradually narrowing upward to a rather long-acuminate rigid point, they narrow also from the lower third or fourth downward to a base which is about 1 cm broad, are dull and subconcolorous on both surfaces, slightly paler; but not glaucescent, beneath; the costæ in the upper surface are prominent and acute, in the lower rounded and bearing a few elongate scales; secondary nerves very slender, and slightly stouter than the very numerous tertiary ones; this causes the two surfaces, when dry, to be finely striate; the margins are slightly thickened. *Spadices* about 20 cm in length with a pedicellar part 3 cm long, recurved in fruit, divided into not very numerous (14 in one specimen) branches; these are irregularly inserted around the main axis, rigid, about 4 cm thick throughout, 12 to 15 cm long, more or less trigonous. *Flowers* mostly distinctly 3-seriate, the uppermost usually bifarious; the areolæ left by the fallen fruits are very superficial, 5 to 6 mm apart in each line, bordered by very narrow bracts; of these the lower are also very narrow with a round margin and not apiculate in the center. *Fruits* small, 12 mm long, 7 mm broad, red, turning dark-purple, ovoid-elliptic, diminishing equally to both ends, inconspicuously mammillate at the apex. *Seed* ovoid, 9 mm long, 6 mm broad, rounded above, not caudiculate at the base, the embryonal foveola somewhat oblique; the branches of the raphe are usually 5, ascending; of these only that of the center passes over the top of the seed, the others bend at its sides, and not at all or but very slightly anastomose. Albumen very

deeply ruminated. *Fruiting perianth* shallowly cupular, 3.5 mm broad and 1.5 mm high, truncate, and slightly narrowed at the mouth.

MINDORO, Mount Halcon, on forested ridges at 1,100 m altitude, *Merrill 5680*, November, 1906.

At the request of Mr. Merrill this fine palm is named after Major-General Leonard Wood to whom Mr. Merrill was indebted for the opportunity of making the ascent of Mount Halcon.

Related to *Pinanga sclerophylla* and *P. negrosensis*, but more especially to *P. rigida*. It is chiefly characterized by its rigid, not very approximate, lanceolate, bicostulate, straight leaflets, and by the spadices with 3-seriate fruits; the fruits are borne on 3-gonous branchlets, which are inserted all around the main axis.

NORMANBYA F. Muell.

Normanbya Merrilli Becc. sp. nov., Plates XXX, XXXI.

A fine palm with the habit of *Areca Catechu* but with a shorter and thicker stem; this is about 25 cm in diameter at its base, and very closely annulate-cicatricose, sometimes not very straight, slightly tapering toward the summit. *Leaves* large, pinnate, about 2 m long, gracefully and strongly arched, deciduous at every new production of spadices, these being infrafrondales, or springing from below the lowest leaves. *Leaf-sheaths* exactly cylindric, 50 to 55 cm long, and about 15 cm in diameter, coriaceous, thinning and truncate at the mouth, strongly striate on both surfaces, when dry covered externally with a very thin and minute ashy-furfuraceous coating. *Petiole* short and broad, 10 to 15 cm long, 5 to 6 cm broad, broadly channelled above, convex beneath, its margins acute. *Rachis* robust, flattened above, narrowly channelled in its basal part and with a slight prominent salient angle higher up, beneath with an obtuse angle below and flattish toward the end. *Leaflets* numerous, about 50 on each side, subequidistant, very closely set at a rather acute angle, and slightly overlapping or subimbricate, narrowly lanceolate, broadest at about the middle, narrowing thence toward the base—where the margins are gradually bent backward—and gradually acuminate to a long, straight, or slightly falcate apex, which in the lower and intermediate leaflets is more or less divided into two linear laciniae; these in the upper leaflets become shorter and finally disappear in the few leaflets near the top, the apex in these being truncate and denticulate-præmorse; the leaflets are besides firmly papyraceous, with only a central costa; this latter not very stout, almost equally prominent on both surfaces in its basal part, nearly vanishing from the middle upward and furnished with a few, very narrow, 5 to 8 mm long, brown, chaffy scales; the margins of the leaflets are conspicuously thickened by a stout nerve, even thicker than the midcosta; the secondary nerves are faint on the upper surface, which is green, almost shining, and slightly longitudinally plicate along some of the nerves; the lower surface is dull and rendered more or less distinctly ash-colored by a very thin, adherent, undetachable coating; moreover the lower surface is unequally striate by secondary and

tertiary nerves which here are more prominent than above; the largest leaflets, the medials, are as much as 70 to 75 cm in length and 4 to 5 cm in width; those near the base are narrower and shorter than the medials and very acuminate; those of the apex, also narrow, often linear, and quite free at the base. From the bases of the leaflets, and between them, especially in the newly expanded leaves, there often hang long strands which are apparently analogous to the filaments interposed between the divisions of the leaves of the *Washingtonias*, and of many other palms having palmate leaves. *Spadix* forming a panicle 40 to 50 cm in length and about as wide, with a thick semilunar base embracing the stem, and a very short (2 to 3 cm long) peduncular part; the panicle is ultradecomound, and is divided into several approximate, alternate, very spreading or almost horizontal, rather thick, gradually diminishing primary branches, of which the lowest are twice branched, and the upper ones simply divided into a few branchlets; these ultimate or flowering branchlets are spreading, slightly arched, 3 to 10 cm long, rigid, terete, 1.5 to 2 mm thick at the base, rugose-striate, (when dry) more or less distinctly zigzag-sinuous in the subulate termination; in their lower part, the branchlets bear all around a few (1 to 6) glomeruli of ternate flowers, one female between two males, and higher, almost distically, only solitary male flowers; there is no distinct bract at the base of the branches or branchlets but only a semicircular raised margin. Spathes not seen by me, very early deciduous; their position is marked by 2 or 3 very narrow annular rings around the base of the spadix. The whole inflorescence is smooth and glaucous when fresh and in flower. The 3-nate flowers are subtended by a common and very short scale-like rounded bract; the central female flower is embraced by two special rather conspicuous sepaloid bracts which are crescent-shaped, and which form under the fruiting perianth a slightly concave, 5 mm broad, cup or calycul; the male flowers of the glomerules are devoid of a special bract, while those at the ends of the branchlets, which are single, have a rudimentary one. *Male flowers* symmetric, when full grown and in bud, regularly oblong-ovoid, slightly narrowing toward a rather blunt apex, 10 to 12 mm long, 7 mm broad; the calyx cupular, its sepals smooth outside, imbricate, sub-rotund-reniform or broader than high, with almost scariose, thin, entire, glabrous margins, otherwise very thinly coriaceous, slightly thickened and gibbous at the base; the corolla twice as long as the calyx; the petals coriaceous, smooth outside, and narrowly elliptic, concave or boat-shaped; stamens numerous, somewhat unequal; filaments filiform, very slender, coalescent by their bases, not inflected at their summit, unequal, anthers narrowly linear, also somewhat unequal, 4 to 6 mm long, usually acute or apiculate at the summit, but occasionally obtuse or even emarginate, inserted on the filament a little above the base of the dorsal side, with very narrow parallel cells, which are united by a relatively broad linear connective and are very shortly divided at their base; rudimentary ovary

conspicuous, with a broadly conical ovoid base, suddenly narrowing into a filiform style, which attains the length of the longest anthers and is not thickened at its top. *Female flowers* opening after the fall of the male ones, globose-conical, acute, about 6 mm long, when the males are full-grown; sepals strongly imbricate, concave, suborbicular; petals very broad, imbricate in their basal part, suddenly contracted into a very short, triangular, valvate point. *Ovary* 1-celled, 1-ovulate, ovoid, with a trigonous acute apex, this being formed by 3 trigonous connivent stigmas (while still enclosed in the bud); ovule suspended laterally in the small basilar cell; staminodes 6, very small and short, with rudimentary anthers, and forming by their united bases a small 6-toothed hypogynous cup. *Fruiting perianth* accrescent, cupular, 10 mm high, 15 mm across at the mouth, covering the lower third of the fruit; the petals considerably larger and longer than the sepals, with more or less crenulate margins. *Fruit* (when quite ripe) bright-red, 3 cm long, 18 mm broad, elliptic-ovoid or slightly ovoid, suddenly contracted into a short stout beak, upon which rest the remains of the black, short, trigonous, connivent stigmas; pericarp slightly fleshy, on the whole about 1 mm thick when dry; epicarp very thinly crustaceous, very minutely shagreened when seen under a strong lens; mesocarp with a few layers of rigid, slightly anastomosing, slender, unequal fibres, of which some in the outer layer are flattened and 0.5 to 1 mm broad; endocarp thin, crustaceous or subpergamantaceous, polished inside, usually more or less adherent to the testa of the seed. *Seed* erect, ovoid, terete, rounded at both ends, 16 to 17 mm long, 13 mm broad, free in the cavity of the endocarp, to which however the greater part of its pellicular testa is adherent, its surface dull; hilum narrow, extending from the base to the top of the seed; the branches of the raphe are numerous, very distinct and impressed, chiefly descending from the top, much branched and forming a close network all around the entire seed. Albumen bony, usually with a small cavity in the center, deeply and closely ruminated, embryo exactly basilar.

Commonly cultivated as an ornamental tree in Manila and locally known as "Bunga de Jolo" and "Bunga de China" (The Jolo or Chinese *Areca*). The original home of the species is doubtful, and it may not be a native of the Philippines. Mr. Merrill, who has supplied me with specimens, informs me that old residents of Manila state that it was introduced from Jolo, one of the islands of the Sulu Archipelago; however, it has not been collected in a wild state anywhere in the Philippines. Mr. Merrill surmises that this may be the "*Areca* palm bearing large clusters of scarlet fruit" mentioned by Burbidge¹ as occurring on the "Hill of Tears," Island of Jolo, above an altitude of 1,500 m.

The nuts of *Normanbya Merrillii* are a good substitute for those of *Areca catechu*, and are somewhat used by the natives for chewing with lime and the leaves of *Piper betle*.

The nearest ally of this palm, amongst those known to me, appears to be

¹ The Gardens of the Sun (1880) 213.

Normanbya (*Ptychosperma*) *Muelleri* from New Guinea, with which it exactly agrees in the structure of the fruit, which is ruminant and terete and not deeply sulcate as in the typical species of *Ptychosperma*. From *Normanbya Muelleri* however it differs in the leaflets, which in that palm are set in groups, while they are equidistant in *N. Merrillii*. Furthermore the termination of the leaflets of *N. Merrillii* is not the same as in *N. Muelleri* and in all species of *Ptychosperma*, which have leaflets praemorse at the tip; those of *N. Merrillii* having a bifid apex. It is however, very evident that this structure is derived from that found in several species of *Ptychosperma*, where the two margins of the leaflets are more or less prolonged into a double acuminate point; in addition the uppermost leaflets in *N. Merrillii* are distinctly praemorse.

The genus *Normanbya* is distinguishable from *Ptychosperma* only by its terete, not longitudinally grooved seed, but though very similar in all other characteristics to this, it is perhaps better to keep it as a separate genus, for if we refuse to attach any value to the characters derived from the form and rumination of the seed, we shall find ourselves obliged to consider the genus *Ptychosperma* as an amalgamation of heterogeneous palms.

ONCOSPERMA Blume.

Oncosperma platyphyllum Becc. sp. nov.

Gracile et subelatum (?). Folia elongata; vagina rubiginose furfuracea et spiculis nigris gracillimis armata; petiolo brevissimo; rhachi subinermi; segmentis numerosis aequidistantibus, 4-5 cm inter se dissitis, ensiformibus, acuminatis; intermediis 60 cm longis, 4-4.5 cm latis; superioribus et basilaribus angustioribus et valde brevioribus. Spadix comparate inter affines brevis, ramulis floriferis 27-28 cm longis, 5-6 mm spissis, apicem versus paullo attenuatis, profunde crebreque scrobiculatis, pulvinulis floralibus orbicularibus, 2 mm latis. Fructus 5-seriati, sphaerici, 14-15 mm diametro, stigmatum residuis lateralibus. Perianthium fructiferum 9-10 mm diametro.

Apparently not a large tree, about of the size of *O. gracilipes*. Leaves elongate, with numerous equidistant leaflets; leaf-sheaths finely rusty-furfuraceous, strongly striated externally and more or less covered with very slender needle-like, unequal, brittle, black, shining spiculæ, which vary in length from a few mm to 2 cm; similar spiculæ are to be found near the margins of the petiole on its under surface and a few are scattered along the under surface of the rachis; the petiole is very short, 2.5 to 3 cm broad, rounded beneath, flat above. The intermediate leaflets are 60 cm long, 4 to 4.5 cm broad, 4 to 5 cm apart, ensiform, straight, acuminate, longitudinally plicate along 2 or 3 secondary nerves on each side of the midcosta; upper and lower leaflets narrower and much shorter. Spadix apparently not very large; the few flower-bearing branches seen by me are about 27 cm long, 5 to 6 mm thick, narrowing a little toward the apex, very closely and regularly grooved by 5 longitudinal rows of orbicular, slightly concave scrobiculi, which have below them a conspicuous, triangular, acute, horizontal or slightly deflexed bract; the circular scar left by the fallen fruits is 2 mm in diameter. Fruit (when

not quite mature) perfectly spherical, 14 to 15 mm in diameter, with a very finely granulated surface, and with the scar left by the stigma quite lateral. *Fruiting perianth* 9 to 10 mm in diameter; the divisions of the calyx and of the corolla very broadly triangular and almost equal. *Seed*

NEGROS, Gimagaan River, *Whitford 1670*, May, 1906.

This species seems at first sight to be very similar to *O. gracilipes*, from which, however, it differs in its broader leaflets, in the more slender branches of the spadix, in the perfectly spherical fruit with quite lateral (not subapical) remains of the stigmas, in the smaller perianth, and, occasionally, in the smaller scars left by the fallen fruits on the branchlets.

***Oncosperma horridum* (Griff.) Scheff.**

MINDANAO, District of Zamboanga, San Ramon, *Copeland 1626*.

The above specimen differs but slightly from the plants growing in the Malay Peninsula, and in the islands of the Malay Archipelago. In the specimen I have seen, the spines covering the spathe are, however, criniform and much more slender than in the type; also the dry fruit has a thinner pericarp and the remains of the stigmas are less prominent. The fruits are 22 mm in diameter.

***Oncosperma filamentosum* Bl.**

PALAWAN, Caranagan River, *For. Bur. 3790 Curran*, February, 1906, in river swamps.

The specimens exactly correspond to those of the plant so common along the estuaries of the Malay Archipelago, the Malay Peninsula, Siam, and CochinChina.

***Oncosperma gracilipes* Becc. in Philip. Journ. Sci. 2 (1906) Bot. 228.**

LUZON, Provinces of Laguna and Tayabas, between Paete and Piapi, *For. Bur. 10148 Curran*, March, 1908, in hill forests, altitude 100 to 200 m.

Growing in clumps, the trunk 10 m high and 12 cm in diameter, fruit red (*Curran*). The fruits are immature, 14 mm in diameter, slightly longer than broad. The plant seems to be more robust than that on which the species was established.

HETEROSPATHE Scheff.

***Heterospathe philippinensis* Becc.**

Ptychoraphis philippinensis Becc. in *Ann. Jard. Bot. Buit. 2* (1885) 90, et in *Webbia 1* (1905) 47.

Cuming distributed this palm under *No. 1476* with flowers only; it has been found again by *A. Loher* at Montalban, Province of Rizal, Luzon (*No. 7091* in *Herb. Kew.*), March, 1906, and on Mount Matulid at 1,200 m elevation, also in the Province of Rizal, in flower and fruit, March 15, 1906, (*No. 7054* in *Herb. Kew.*).

It is a slender palm 1 to 2 m high, with a *stem* apparently about 2 cm in diameter, sometimes stoloniferous; the *leaves* are delicate, about 80 cm long in the pinniferous part, with numerous very regularly set leaflets; petiole deeply channelled above; leaflets thinly papyraceous, narrow and elongate, very slightly falcate near the apex, which is very acuminate, and has a very shortly cleft tip; the medials are 25 cm long and 12 mm broad; the upper ones are gradually shorter but are not or only slightly narrower, while the lower ones are narrower but not at all or only slightly shorter. The *spadix* is small, about 45 cm long in one specimen, with a very lax panicle carried on a rather long straight peduncular part; the panicle is composed of a few, very spreading,

straight, and filiform branches, of which the lower are bi- or tri-furcate, and the upper simple. The *spathes* are two; the lowest is 18 cm long, flattened, two-edged, with very sharp or narrowly winged margins and a narrowly lanceolate, acuminate, marcescent limb, the second spathe is tubular, closely sheathing lower down, and marcescent above. *Male flowers* oblong, 3 mm long; the segments of the corolla deeply striated externally. *Fruits* ovoid-subventricose, almost symmetrically very suddenly and conspicuously beaked, 10 mm long, 6 mm broad, finely shagreened by numerous linear sclerosomes. *Seed* globular-ovoid, 6 mm long, 5 mm broad.

***Heterospathe negrosensis* Becc. sp. nov.**

Gracilis, 3–5 m alta, caudice 6–9 cm diametro. Folia in parte pinifera circiter 1.2 m longa, petiolo longiusculo (circiter 50 cm longo), segmentis aequidistantibus, circiter 3 cm inter se dissitis, ensiformibus, acuminatis, prope apicem nonnihil falcatis, intermediis 35–40 cm longis, 2–2.5 cm latis. Spadix nutans, 70 cm longus (in specimine uno) longe pedunculatus, ramulis floriferis teretibus, filiformibus crebre sinuosis, 13–20 cm longis, vix 2 mm crassis. Fructus anguste ellipsoidei, utrinque subaequaliter attenuati, basi acutiusculi, superne fere symmetrice cuspidati, 10–11 mm longi, 5 mm crassi, extus crebre granuloso-lineolati, perianthio late cyathiformi et bracteolis parvis cupulam parvam incompletam simulantibus suffulti; semine ovoideo, basi rotundato, superne acuto, 7.5 mm longo, 4 mm crasso.

This is a more robust plant than *H. philippinensis*, of which, perhaps, it may be considered as the representative form in the Island of Negros. The leaves are larger and have larger leaflets; and the spadix is considerably more robust, with a peduncular part about 10 mm thick, and about 50 cm in length; the fruit is more elongate and very distinctly cuspidate, or acutely beaked, and, consequently, the seed is also more distinctly ovoid and rather acute.

The specimens which I consider as typical, were collected in the Island of Negros, by *H. N. Whitford* (No. 1539) in May, 1906, on Mount Silay, Province of Occidental Negros. In the same Island it has also been collected by *A. D. E. Elmer* at Dumaguete, Cuernos Mountains, Province of Negros Oriental, in March, 1908. Nos. 9434 and 10147. In Elmer's specimens the leaflets are smaller and the fruits less acuminate than in those represented by Whitford's material; consequently they are nearer than the latter to the true *H. philippinensis* of Luzon.

I reproduce here Elmer's field note of his No. 9434: "Slender erect trees 3 to 5 meters high; in damp mossy woods at 4,000 feet or more; stems 2 to 3 inches thick, obscurely ringed, with soft reddish wood; leaves 1 to 3 m long; the lower one-third without leaflets, the basal portion of the petioles expanded, the sides soon becoming marcescent; inflorescence paniculate, 1 to 3 feet long, upon equally long peduncles; flowers small, sessile, cream-white throughout; fruits green, becoming yellowish, and ultimately vermilion-red; the fruits are sometimes eaten, are not hard but wholly tasteless." *N. v. salaway*.

***Heterospathe cagayanensis* Becc. sp. nov.**

Arbor mediocris, circiter 6 m alta. Folia ampla, segmentis aequidistantibus circiter 5 cm inter se dissitis, ensiformibus, acuminatis, prope apicem leviter falcatis, intermediis 65 cm longis, 3 cm latis. Spadix

patule duplicato-ramosus, ramulis floriferis teretibus, vulgo 15-18 cm longis, rigidis, crassiusculis, 2-2.5 mm spissis. Fructus spherici, stigmatum residuis fere exacte apicalibus apiculato-mucronati, 7 mm diametro, perianthio concaviusculo minime pedicelliformi et bracteolis conspicuis, in cupulam brevem elevatis, suffulti.

A tree about 6 m high. *Leaves* large; leaflets equidistant, about 5 cm apart on each side, ensiform, slightly falcate near the end, very gradually acuminate to a long subulate tip, papyraceous, shortly and slightly narrowed toward a not very acute base, subconcolorous on both surfaces, unicostate, accompanied on each side of the mid-costa by two rather prominent and distinct secondary nerves; the margins conspicuously thickened; at the base of the mid-costa on the upper surface is to be found a small but very distinct glandular tubercle; the few leaflets seen by me are apparently from the central part, these are 65 cm long, 3 cm broad. The *spadix* is diffusely twice branched, the primary branches being divided into 2 to 4 flowering branchlets; these are rigid, terete, usually 15 to 18 cm long, 2 to 2.5 mm thick, bearing the flowers and fruits spirally arranged. *Fruit* spherical, almost centrally mucronate-apiculate by the remains of the stigmas, 7 mm in diameter. *Seed* 5.5 mm in diameter. *Fruiting perianth* very slightly concave. Floral bracts forming a distinct shallow cup for receiving the base of the perianth. The main axis of the spadix and branchlets very minutely scabrid.

LUZON, Province of Cagayan, *For. Bur.* 11286 Klemme, April, 1908, local name *dumayaca*.

Closely related to *Heterospathe elata*, but distinguished by its branches and branchlets being shorter, thicker, and more rigid, more deeply scrobiculate, while the flower bracts form a distinct cup; by the fruit being less distinctly tuberculate on its surface, with the remains of the stigmas almost central; and by the perianth being almost explanate and not subpedicelliform.

ARENGA Labill.

Arenga tremula Becc. comb. nov.

Caryota tremula Blanco Fl. Filip. (1837) 744; Kunth Enum. Pl. 3 (1841) 549.

Caudex crassus et brevis, 2 m altus ad summum, circiter 30 cm diametro. Folia amplissima, usque ad 5 m longa, segmentis numerosis alternis; intermediis 55-70 cm longis, ambitu irregulari, in utroque margine antrorsum lobatis et sinibus 4-6 saepius oppositis, minusve excavatis, in sinibus 4-7 cm dum caetero 7-12 cm latis, serratis, apice rotundato vel lobulato, versus basin plerumque vel longe cuneatis, ipsa basi acuta, ad insertionem in marginem majori saepius auriculatis; pinna terminali anguste cuneato-flabellata, ovato-oblonga. Flores masculi subclavato-oblongi, basi parum attenuati, in vertice rotundati, staminibus circiter 150. Fructus globoso-oblongi, utrinque rotundati, in vertice obscure 3-costulati, 3.5 cm longi, 3 cm crassi, seminibus elongato-ellipticis, subtrigonis, utrinque obtusis, 25-26 mm longis, 17 mm latis.

Stem short and thick, 2 m. high at most, and about 30 cm in diameter. *Leaves* very large, as much as 5 m in length, very similar to those of *A. Ambong*; the leaflets are numerous, alternately subequidistant, in the intermediate portion of the rachis they are 5 to 7 cm apart, and have a conspicuous axillary callus at their insertion; they are firmly papyraceous, green above, paler underneath and whitish, especially when young; the mid-costa is inconspicuously dotted with very minute, orbicular, brown scales; their general form is very irregularly elongate-lanceolate, but the outline is more or less deeply broken by 4 to 6 superimposed indentations and their corresponding lobes, they are more or less cuneately narrowed below to an acute base, which is often shortly auricled on the lower margin; usually the leaflets are also somewhat narrowed above to an obtuse or broadly rounded, or even bilobed apex; the margins of the lobes are irregularly and sharply dentate-serrate; the terminal leaflet is cuneately flabellate and deeply bilobed, the others (in full grown plants) are 55 to 70 cm long, and 4 to 7 cm wide in correspondence with the indentations, and 7 to 12 cm in their broadest parts. *Spadices* with several simple flowering branches, these at the time they are loaded with fruits are subterete, 12 to 14 mm in diameter, glabrous and with a polished surface in the spaces between the fruits. *Male flowers* in bud, when full grown, are subclavate-oblong, 17 to 18 mm long; the calyx shortly cupular, slightly narrowed at the mouth; the sepals broader than high and with a split-crenulate margin, more or less gibbous at the base; petals oblong and boat-shaped, acute but not apiculate; stamens very numerous (150 or more at times); anthers very narrow, subulate, aristate; the scars left by the fallen flowers bear the punctiform marks of 30 to 40 fibro-vascular bundles. The two special bracts of each female flower, after the fall of the fruit, are arched, crescent-shaped, entire and forming a very shallow cup, but with their margins not or only slightly overlapping each other. *Fruiting perianth* 27 mm broad; the sepals transversely elongate-reniform, similar to the floral bracts, but with split-crenulate margins, 12 to 13 mm broad, 5 mm high; the petals coriaceous, concave, deltoid, 15 mm long and about as broad. *Fruits* globose-oblong, equally rounded at both ends, 3.5 cm long, 3 cm broad, not very distinctly tricostulate on the top, and with a small trigonous cleft in the center of this. *Seeds* elongate-elliptic, 25 to 26 mm long, 17 mm broad, sub-trigonous, convex on the back, and with an obtuse salient angle on the axial side, blunt at both ends.

Apparently widely distributed in the Philippines. LUZON, Province of Tayabas, *For. Bur.* 10213, 10280 *Curran*, local name *caong*. CEBU, *Bur. Sci.* 1737 *McGregor*. PALAWAN, ridge slope 2 miles northwest of Irauan, altitude 200 m, *For. Bur.* 3542 *Curran*, January, 1906; Mount Victoria, *Bur. Sci.* 735 *Foxworthy*, March, 1906, altitude 250 m, local name *Ubud*. BALABAC, *Merrill* 5372, October, 1906. A source of sago, the buds also used for food (*Curran*). The wild people of Palawan, the Tagbanuas, use the pith from the petioles for plugs on the ends of their arrows, to make them fit tightly into their blowguns (*Merrill*).

There is little or no doubt that this is *Caryota tremula* of Blanco. That author, however, describes the female flowers of this palm as having 6 sepals, probably because he considered the bracts as sepals.

Arenga tremula is very closely related to *A. Ambong*, from which it differs by the male flowers having a rounded top, and more numerous stamens; but specially in its oblong, not spherical fruit.

ORANIA Zipp.

Orania decipiens Becc. sp. nov.

Robusta, caudice circiter 8 m longo, 24 cm diametro. Frondes 4-5 m longae, segmentis supra nitidis, subtus albicantibus, praecipue prope basin pluricostulatis; majoribus usque ad 1 m longis. Spadices ampli, duplicato-ramosi, longe pedunculati, ramulis floriferis gracilibus, inferioribus 40-45 cm longis, superioribus brevioribus, e basi 3 mm crassa sursum in acumen tenue leviter et regulariter "zig-zag" sinuosum sensim attenuatis. Flores in ramulorum dimidiam inferiorem partem terni, intermedio foemineo, alaribus masculis, caetero geminati et tantum masculi. Fructus globosi, basi nonnihil attenuati, ibique subacuti, 40-42 mm longi, 35-37 mm lati; epicarpio fragili, tenui; mesocarpio 3-4 mm spisso, fibris numerosis crassis, fere osseis, in superficie endocarpi erectis, praedito; endocarpio lignoso, tenui, basi paullo producto et obtuse apiculato; semine globoso, basi paullo explanato, 23 mm lato; embryone supra medium locato; albumine osseo, intus pleno.

Stems 8 m high and 24 cm in diameter. *Leaves* large, 4 to 5 m long (Merritt), apparently very similar to those of *O. philippinensis*. Leaflets almost shining above, dull and whitish beneath, with the mid-costa very robust accompanied on each side by 3 or 4 other minor costae, and with several secondary nerves between these; the median leaflets the largest, up to 1.5 m long, 6 cm broad. *Spadices* large, twice branched, with a robust, and at its base 7 to 8 cm thick, peduncular part; the ultimate divisions or flowering branchlets are slender and of these the lower are 40 to 45 cm long, the upper shorter, 3 mm thick at the base and from here gradually diminishing to a slender, and slightly but regularly, zig-zag-sinuous tip. The flowers are 3-nate in the lower half of the branchlets, and here the flower in the center is female, those at the sides male; upward only geminate male flowers are to be found. *Fruits* spherical in their upper part, slightly prolonged downward into a blunt and slightly gibbous point at their bases which gives them a subpyriform shape, 40 to 45 mm long and 35 to 37 mm broad; epicarp thin and brittle; mesocarp 3 to 4 mm thick, full of numerous, short, almost bony fibers, which are erect in respect to the surface of the endocarp; this is very thin and woody, on the whole spherical and like the general form of the entire fruit slightly prolonged at the base into a very obtuse point. *Seed* globose, with a slightly flattened base, 23 mm broad; the embryo is placed rather far above the middle; albumen bony, solid throughout. The base

of the fruit being slightly asymmetric, the divisions of the perianth are unequally deflexed; otherwise the fruiting perianth is not accrescent, and the segments of the corolla are deltoid, rather blunt and thickish.

MINDORO, Bongabong River, *For. Bur.* 4120 Merritt, May, 1906. *N. v. banga*. MINDANAO, District of Zamboanga, Port Banga, *For. Bur.* 9179 Whitford & Hutchinson, January, 1908. The fruits of the specimens from this last locality are however slightly smaller than those of the typical form from Mindoro; they are 37 mm long and 31 to 32 mm thick, and have a thinner mesocarp with the woody fibers less distinctly normal to the surface of the endocarp. Evidently this is a local form, which may be distinguished by the name *mindanaensis*.

The fruits of *Orania decipiens* are about the size of those of *O. macrocladus*, and by a superficial observation they might be mistaken for these; they are however slightly larger and are not, like those of *O. macrocladus*, perfectly spherical, but are slightly diminished toward the base; they also differ from those of *O. macrocladus* by the thicker mesocarp, full of the peculiar kind of bony fibers erect on the surface of the mesocarp, and interposed between it and the epicarp, which are characteristic of *O. regalis*, *O. philippinensis* etc.; in *O. macrocladus* this kind of fiber is wanting; moreover the position of the embryo differs in the two species, it being placed below the middle of the seed in *O. macrocladus* and not very far from its summit in *O. decipiens*.

LIVISTONA R. Brown.

Livistona Whitfordii Becc. in Martelli's *Webbia* 1 (1905) 341.

To this species I refer *For. Bur.* 5876 Curran, collected to the north of Aglao, Province of Zambales, Luzon, January, 1907. The height of the plant is said to be 25 m with the trunk 40 cm in diameter. The fruit (which I have not seen) is 2 cm in diameter. Native name *tekis* (Curran).

I have described² the petiole of this species as quite smooth, but in the specimen mentioned above, it is armed in its lowest part with rather robust recurved spines, but in the remaining part only with scattered rudimentary tuberculiform spinules, of which some are nearer its apex.

Livistona mindorensis Becc. sp. nov.

Elata, caudice ad 28 m longo, 20 cm diametro. Frondes regulariter multifidae; petiolo inermi; segmentis in parte centrali alte unitis, externe fere usque ad basin separatis, chartaceis, superne nitidiusculis, subtus paullo pallidioribus, profunde bipartitis, sive in lacinias duas longe acuminatas, attamen non flaccidas, divisas. Spadices elongati in quovis spatha terni, sive jam ab ima basi in 3 spadices partiales, aequales, collaterales, ex apice spathae primariae unicae, valde compressae, erumpentes, divisi. Quisque spadix partialis rigidus, rectus, digiti crassitie, teres, spathis tubulosis apice breviter apertis, arcuato vaginatus; inflorescentiis partialibus 20–25 cm longis, jam a basi bipartitis, caetero simpliciter ramosis, ramulis fructiferis majoribus 7–8 cm longis. Fructus parvi, sphaerici, 13–14 mm diametro (non plane maturi).

A slender and tall tree, the trunk rising to 28 m in height and being 20 cm in diameter (Merritt). *Leaves* orbicular, regularly multifid and

² *Webbia* loc. cit.

with a large, central, undivided part, the primary sinuses remaining at about 80 cm from the apex of the petiole, while at the sides they are only a few centimeters from it; petiole (in one specimen) with quite smooth margins from the base throughout; segments papyraceous, rather brittle, when dry subshining above, slightly paler beneath; transverse veinlets fine and rather sharp; in the leaves of not quite full-grown plants the segments are very deeply bifid and the divisions are elongate, very acuminate, but not hanging; the central segments of the leaves of the adult plant are at their point of separation 4.5 cm broad, and diminish from this point very gradually toward the end, which is deeply bifid, the divisions being about 15 to 20 cm long, and apparently not, or only slightly, hanging. *Spadices* very elongate, triple, or composed of 3, equal, collateral spadices which are quite free from the base and protrude from the same basal spathe; the *sheath* is coriaceous, brittle, of a reddish-brown color, like all the other parts of the spadix, glabrous and shining, strongly flattened, 9 cm broad, with two almost winged edges; the partial spadices are rigid, straight with several rather distant partial inflorescences, and with the undivided axial parts terete, as thick as a finger, tightly sheathed by tubular spathes, which are quite glabrous, briefly open, expanded at the apex, and terminating with an auriculiform, rather obtuse, or at times shortly bidentate limb. Partial inflorescences divided from near the base into two main branches, these bearing numerous simple floriferous branchlets, of which the lowest are 7 to 8 cm long and the others gradually shorter. The *fruit* is spherical, 13 to 14 mm in diameter, when not quite mature.

In the forests, a few metres above the level of the sea, Bongabong River, MINDORO, *For. Bur.* 4108 Merritt, May, 1906.

It is clearly allied to *Livistona rotundifolia* and *L. microcarpa*, but is distinguished from both by the central segments deeply bifid and with the divisions elongated and gradually acuminate. Moreover I do not know of any other species of *Livistona* with three distinct, equal, collateral spadices issuing from the same basal spathe; but then it is not certain whether or not this is accidental, or is a constant characteristic of *L. mindorensis*. The three flowering axes or partial spadices are very similar in their dimensions, branching, color, and spathes to the corresponding parts of the above-mentioned species. The fruits of *L. mindorensis*, however, are apparently larger than those of *L. microcarpa*, and smaller than those of *L. rotundifolia*.

***Livistona inaequisecta* Becc. sp. nov.**

Robusta; frondium petiolo in parte basilari crebre spinis robustis, plus minusve reversis, 10–15 mm longis armato, superne subinermi; limbo amplo, inaequaliter profunde duplicato-partito, segmentis majoribus 2- vel 3-costulatis, profunde 2- vel 3-partitis, laciniis elongatis, acuminatissimis et apice flaccidis. Spadix elongatus, in 7 vel 8 inflorescentias parciales divisus, spathis primariis subtiliter coriaceis, basi tubulosis, superne antice fissis et apice lanceolato-auriculatis, ad margines fibrosis; inflorescentiis partialibus arcuatis, amplis, duplicato-ramosis, ramulis fructiferis tere-

tibus, 10–20 cm longis et ad basin 2–2.5 mm crassis, crebre tuberculatis. Flores parvi, globosi, 1.6 mm lati. Fructus globosi, perianthio brevissime pedicelliformi suffulti, 14–15 mm diametro, ad maturitatem azureis et nitidis; mesocarpio parcissime crasso; endocarpio tenuissimo, fragili. Semen globosum, non exacte sphaericum, 11 mm latum, intus fere usque ad medium processu raphidis cylindraceo perfossum.

A large and robust tree. *Leaves* large, the blade measuring in one specimen 1.25 m from the ligule to the end of the central leaflets (this came apparently from a full grown plant); leaf-sheaths disintegrated into fibers of a reddish color, and with the principal vascular bundles forming long, woody, very rigid, flattened strands, 2 to 5 mm broad. Petiole armed in its lower portion with numerous and approximate, more or less reversed spines, which have a tumescent base 10 to 12 mm broad, and are 10 to 15 mm long; in the upper portion the petiole bears only a few small superficial spines at the sides near the apex; ligule short, woody, crescent-shaped, with a smooth margin; the blade is firmly papyraceous, green and concolorous on both surfaces, with the divisions marked by very fine and inconspicuous, transverse veinlets; the blade is orbicular in outline, very deeply and unequally multifid, some of the sinuses or reëntering angles between the divisions being either deeper, or else situated nearer the apex of the petiole than others; the deeper sinuses divide the blade into several primary partitions or segments, which are 2- or 3-costulate, and are in their turn subdivided higher up into 2 or 3 secondary segments, the secondary segments are thus separated from each other by the secondary sinuses, and are again deeply cleft into two very acuminate hanging laciniae; of the primary divisions the outermost remain free a few centimeters above the apex of the petiole; and have very narrow secondary segments and very long and flaccid laciniae; the intermediate are united for a longer distance, and the single segments are 3 cm broad where they separate from each other, and have shorter ultimate laciniae than the outermost; the union of the central extends still higher up and the single segments are 4 cm broad at their base, and though also long acuminate are shorter than in all the preceding segments. The *spadix* in one specimen has the peduncular part as thick as the wrist and is divided into 7 or 8 partial inflorescences; these are arched, rather large, twice branched, and have their main axis divided near the base into two branches; the fruiting ultimate branchlets are terete, 10 to 20 cm long, 2 to 2.5 cm thick at the base, with the pulvinuli of the fallen flowers very close together and tuberculiform. The *spathes* are thinly coriaceous, brown, scaly-furfuraceous externally, shining and darker inside, rigid, with a long basal tubular part, which terminates in an elongate auriculiform limb; this is more or less lacerated and fibrous at its margins. *Flowers* small, globular, 1.6 mm in diameter; the sepals orbicular, thick only at their base, otherwise very thin and hyaline; the

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corolla is twice as long as the calyx, its divisions deltoid and thickish; the staminal urceolum is 6-lobed, the lobes broader than high, with a very short subulate filament in the center of their retuse upper margins; anthers, after dehiscence, orbicular; carpels glabrous, the style very short. *Fruits* globular, 14 to 15 mm in diameter, when quite mature polished and of a bluish color externally; the mesocarp very scanty; the endocarp woody, very thin, brittle. *Seed* globular, but not a true sphere, 11 mm broad, the intrusion of the raphe cylindraceous, penetrating almost to the center of the albumen. *Fruiting perianth* forming a pediculus to the fruit, very small and short, not quite 2 mm broad.

Luzon, Province of Laguna, Santa Maria Mavitac, *For. Bur.* 10079 Curran, February, 1908, n. v. *ticol*; Cavinti, *Loher* 7058, February, 1906, (Herb. Kew.).

Among the Philippine species of *Livistona* this is easily distinguishable by its leaves being unequally parted into several primary 2- or 3-costulate divisions, having the ultimate divisions very long, very gradually acuminate, and more or less flaccid, and by its round fruit. It is however very closely related to *L. cochinchinensis*, which has also leaves with 2- or 4-costulate primary divisions; but *L. inaequisecta* has smaller flowers and these have the sepals callous and thick only at their base and in the greatest peripheric part are very thin and pellucid, or hyaline. The fruits also are apparently smaller, at least the few that I have seen.

ZALACCA Reinw.

Zalacca Clemensiana Becc. sp. nov.

Folia ampla, petiolo spinis longis armato, segmentis interrupte fasciculatis, elongato-lanceolatis, supra viridibus, nitentibus et albicantibus; intermediis fere rectis et non longe acuminatis, 45 cm longis, 6-6.5 cm latis; superioribus apicem versus leviter falcatis et abrupte in acumen subulatum coarctatis, basi tantum 3-costulatis, caetero unicostatis, costulis lateralibus superne evanescentibus. Spadix masculus ut videtur brevis, in ramos nonnullos approximatos divisus; ramis 6-8 spicas approximatas ferentibus; spathis primariis extus ferrugineo-tomentosis, marcescentibus et dilacerato-fissis; spicis masculis, dum florentibus, cylindraceis, gracilibus, 5-7 cm longis, 10-11 mm crassis, spathellis distinctis, non in annulum connatis, bracteiformibus, late concavis, acutis, striatis; bracteolis parvis, lanoso-ramentaceis. Flores masculi spathellas paullo superantes, 4 mm longi; calyce fere usque ad basin 3-partito, phyllis linearibus subhyalinis; corolla calyce paullo longiori, basi attenuata, fere usque ad medium 3-partita, segmentis oblongis.

Leaves very large, covered with long spines in the petiolar part; rachis in the intermediate portion acutely trigonous, with a line of long spines beneath along the center. Leaflets interruptedly fasciculate, elongate-lanceolate, rigidly papyraceous, shining above, having a very tenuous and adherent ashy-colored coating beneath; the intermediate leaflets almost straight, about 45 cm long, 6 to 6.5 cm broad; those near the summit, and apparently also those near the base, slightly falcate towards the

apex, where they abruptly and symmetrically taper into a long filamentose tip; the margins minutely spinulose from the middle upward, the spinules becoming closer near the apex; transverse veinlets very sharp and prominent on the upper surface, much less visible underneath; the mid-costa almost equally prominent on both surfaces, smooth and accompanied on each side by several unequal, slender, parallel, secondary nerves, of which one, lying nearer to the margin, is often stronger than the others, especially near the base, where the leaflets may be called subtricostulate; but these side costae evanesce upward. *Male spadix* apparently short, with several approximate short branches; each branch being subtended by a primary spathe and bearing 6 to 8 approximate spikelets; the primary spathes are covered with a tenuous, rusty, soft indumentum, are marcescent and much lacerated or split longitudinally, and reduced to several strips and filaments. *Male spikelets* when in flower cylindraceous, slender, 5 to 7 cm long, 10 to 11 mm broad, borne on a very short pedicel, which is embraced by a short and broad, membranaceous, bracteiform secondary spathe; the spathes are not connate by their margins and they do not form an annular involucre, as is usual with the other species, but are individually distinct, bracteiform, concave, very broad, acute, and striate, each bearing two flowers; bracteoles small woolly-ramentaceous. *Male flowers* small, slightly longer than the spathelets, 4 mm long; calyx split to the base into 3, linear, thinly membranaceous or subhyaline, striate segments; the corolla is slightly longer than the calyx, three-parted nearly to the middle, and tapering below, its segments are short, oblong; stamens united to the corolla as far as the base of the segments; anthers oblong, obtuse.

MINDANAO, Lake Lanao, Camp Keithley, *Mary Strong Clemens* 1109, June, 1907.

In its leaflets being whitish beneath, this species approaches *Zalacca Blumeana*, *Z. edulis*, and especially *Z. vermicularis*, but it differs from these as from all the other species known to me, in the spathes and the male spikes, which are individually distinct, and are not connate by their margins to form a compound annular spathe.

KORTHALSIA Bl.

Korthalsia scaphigeroides Becc. sp. nov.

Gracilis, caudice 15–18 mm diametro; ocrea inflata, elongato-elliptica, 9–10 cm longa, 2 cm crassa, subtiliter coriacea, aculeis parvis, brevibus, sparsis, armata. Frondes plantae nondum fertilis non cirriferæ, petiolo gracili, complanato, biconvexo, circiter 20 cm longo, 4 mm lato, ad margines inermi; segmentis distincte ansatis, anguste rhomboideo-cuneatis, 15–20 cm longis, 4–6 cm latis, superne in acumen centrale tenue, elongatum, productis et argute dentatis, subtus albicantibus et costulis ad 7 percurtis.

Rather slender, the sheathed stem apparently 15 to 18 mm in diameter.

Ocrea elongate-elliptic, ventricose, 9 to 10 cm long, 2 cm broad, thinly coriaceous, armed with small scattered, short, rigid prickles. Leaves with a slender biconvex, flattened petiolar part, about 20 cm long, 4 mm broad, with rather obtuse and smooth edges, armed beneath along the center with a few solitary claws; rachis in the intermediate portion armed almost regularly with ternate claws; leaflets distinctly ansate, narrowly rhomboid-cuneate, broadest above their middle, 15 to 20 cm long, 4 to 5 cm broad, rather acutely praemorse-dentate in the upper margins, and produced at the summit into an acuminate point, green above, white beneath, with about 7 primary costae. Spadix unknown.

MINDANAO, District of Zamboanga, *For. Bur. 4816 Hutchinson*, July, 1906. N. v., *tanguguid*.

This is to all appearances the representative form in the Philippines of *K. scaphigera* from which it differs in the much more elongate ocrea.

To *K. scaphigeroides* are probably to be referred some noncirriferous leaves from young plants collected on BASILAN ISLAND, *For. Bur. 6106 Hutchinson*, July, 1906.

***Korthalsia squarrosa* Becc. sp. nov.**

Mediocris, caudice vaginato, 2 cm diametro. Frondes cirro verticillatim aculeato terminatæ; vagina spiculis gracilibus, 5-6 mm longis, armata; ocrea longiuscula (6-7 cm longa), chartacea, marcescenti et fragili, arcte vaginanti, minime inflata, in ventre aperta; petiolo superne plano, subtus convexo, ad margines spinis nonnullis reetis, horizontalibus, armato; segmentis longiuscule ansatis, rhomboideo-cuneatis, 18-20 cm longis, 6-7 cm latis, supra viridibus, subtus albicantibus, antice argute inaequaliter dentatis, dentibus majoribus aristatis. Spadicis spicae floriferae cylindraceae, apice obtusae, 20 cm longae, 20-22 mm crassae, squarrosae, bracteis in tomento non immersis, late ovatis, argute venoso-striatis; apice non adpresso, triangulari; floribus inter bracteolas in dorso carinatas et paleolis vestitas, nidulantibus, 13 mm longis; calyce cyathiformi, usque ad medium trilobo; corolla calyce 3-plo longiori. Fructus

Sheathed stem about 2 cm in diameter. *Leaf-sheaths* armed with very small slender spiculæ, 5 to 6 mm long, resting on a tuberculiform base. *Ocrea* papery, marcescent, brittle, rather elongate (apparently 6 to 7 cm long), closely sheathing but open on the ventral side (not inflated). *Leaves* of the adult plant terminated by a long and slender cirrus, which is densely armed with semiverticillate, very slender, sharp claws; petiole quite flat above, convex beneath with acute margins, sparingly armed with short, straight, horizontal spines. Leaflets green above, white beneath; those of the upper part of cirriferous leaves having 11 main and radiating nerves or costae and being 18 to 20 cm long and 6 to 7 cm broad in their upper part, from where they gradually or cuneately narrow downward to a very acute and distinctly ansate base; the upper part of the blade is triangular and acuminate and acutely but irregularly toothed, with the largest teeth aristate. *Spikes* cylindraceous, thick and short, and

with a blunt apex, 20 cm long and 20 to 22 mm in diameter, squarrose or with the larger bracts or spathes not immersed in wool, very broadly ovate and terminated by a free, triangular, not appressed, point; this is very finely, neatly, and striately veined longitudinally. *Flowers* 13 mm long, hermaphrodite, solitary in the axils of the bracts from which the summit of the corolla emerges; the flowers are not immersed in wool, but are placed between and tightly embraced by two, special, elongate, concave bracteoles which are acutely carinate on the back and are covered on the carinae and at the summit with furfuraceous, appressed paleolae (not woolly hairs); calyx cyathiform, parted to the middle into 3, broadly ovate, obtuse, concave lobes, very finely striate-veined; corolla about 3 times as long as the calyx, parted to about the middle into 3 oblong segments. *Fruit*

PALAWAN, near Iwahig, *For. Bur.* 4185 Curran, May, 1906.

Of this very distinct species I have seen fragments of the stem and of one leaf and a few detached spikes with flowers in an advanced stage. It is a species very well characterized by its thick, squarrose, glabrous spikelets, the bracts and the flowers not being immersed in wool. In this respect *Korthalsia squarrosa* closely resembles *K. robusta* Bl., which has the same kind of spikes and flowers. The spikes with squarrose spathes are quite different from the usual form in *Korthalsia*, being very similar to those of some species of *Zalacca*.

To *K. squarrosa* apparently belongs a sterile specimen collected by Elmer D. Merrill, No. 5384, on BALABAC ISLAND, although this has much broader leaflets than those of the specimen described above; but this in *Korthalsia* is a very variable characteristic, as the breadth of the leaflets seems to vary on the same plant with its age and with their position along the stem.

In the above-mentioned specimen collected by Merrill, the leaf is about 70 cm long in the pinniferous part; the petiole is 10 cm long; the rachis is irregularly armed with small alternate claws; the leaflets are few, 6 or 7 on each side, rhomboid, distinctly ansate, especially the upper ones, 15 to 20 cm long, 8 to 10 cm broad; the ocrea is truncate at the summit, open on the ventral side, 12 cm long, and armed with very slender, needle-like, horizontal spiculae, 10 to 15 mm long.

Vidal 4066, collected at Sorsogon, Luzon, is also a *Korthalsia*, but the specimen of this number in my herbarium is indeterminable, as it consists only of the intermediate portion of a leaf which resembles that of Merrill 5384, but larger and with a shorter petiole; probably Vidal's specimen belongs to a species differing from *K. squarrosa*.

CALAMUS Linn.

Calamus Hookerianus Becc. in Ann. Bot. Gard. Calcutta 11: tab. 70.

I have identified with this species a *Calamus*, *For. Bur.* 10630 Curran, collected at about 200 m elevation on the Adumay Hills, Province of Albay, Luzon, June, 1908.

The above-mentioned specimen exactly agrees with plate 70 of my monograph; the leaflets, however, of the type specimen bear bristles on three nerves on the upper surface, but beneath only on the mid-costa, while in Curran's specimen three nerves on both surfaces are bristly.

The native country of *C. Hookerianus* was not previously known, the type specimen in the Herbarium at Kew being of uncertain origin; now that we

know that *C. Hookerianus* is a Philippine species, it is possible that the original specimen was one of Cuming's distributed plants.

The extremely elongated spadix, the very long, slender, simple partial inflorescences, the long, divaricate, cylindraceous spikelets, the forms of the spathels, involucre, and perianths of the young fruits, are exactly the same in Curran's specimen and in the type of the species at Kew.

***Calamus Arugda* Becc. sp. nov.**

Scandens, mediocris. Folia (cirrifera) nonnihil ampla, segmentis aequidistantibus, in parte media 6-7 cm inter se dissitis, e basi acutiuscula elliptico-lanceolatis, acuminatis, rigide chartaceis, 5-costulatis, inferne nudis, superne vix vel non secus costulas spinulosis, medianis 45-46 cm longis, 5-6.3 cm latis. Spadix foemineus densus, in ramulos breves utrinque spicis 3-4 valde approximatis praeditos; spathis superioribus tubuloso-infundibuliformibus, 3-5 cm longis, in ore marcescentibus; spicis brevibus, 3-4 cm longis, paucifloris; spathellis concavis amplexantibus. Flores foeminei vulgo in spicarum parte basilari gemini, et flore alari vel neutro destituti, supernè solitarii et flore neutro comitati. Fructus (imaturi) ovoideo-elliptici, basi attenuati, superne late conice rostrati; squamis per orthostichas 15 ordinatis, squarrosis, apice paullo productis et eroso-ciliolatis.

Scandent, of moderate size or rather large, the stems (naked canes ?) 3 cm in diameter (Klemme). *Leaf-sheaths* *Leaves* rather large; in the small portion seen by me they have equidistant, alternate, not very closely set leaflets (6 to 7 cm apart); the intermediate portion of the rachis is slightly convex beneath and is here armed with small claws along the middle, above it is 2-faced with an obtuse, salient angle. Leaflets elliptic-lanceolate, broadest at about their middle, and narrowing equally to both ends, gradually acuminate to a not conspicuously bristly tip, the base acute, rigid-papyraceous, green, slightly paler beneath than above, 5-costulate, the costæ very sharp, smooth, or bearing a few inconspicuous spinules above, quite smooth beneath, margins very minutely and appressedly spinulose from the base, transverse veinlets very fine, very approximate and continuous; the leaflets seen by me, apparently belonging to the intermediate portion of a leaf from a young plant, are 45 to 46 cm long, 5 to 6.3 cm broad. *Male spadix* *Female spadix*, not entire, apparently very dense; the summit of one (or of a partial inflorescence ?) with several short, approximate branchlets, each of these terminated by a short, unarmed, thick, caudiculum, 10 to 15 cm long. *Spathes* (primary or secondary ?) tubular-infundibuliform, 3 to 5 cm long, thinly rusty-furfuraceous, thinly coriaceous, exsuccous, marcescent, and more or less fibrous-lacerate at the mouth, prolonged at one side into a triangular, acuminate and acutely, dorsally keeled point; the keel covered with rigid spiculiform bristles which rest on bulbous bases; branchlets inserted inside, but near the mouth of their respective spathes, 6 to 8 cm long, with 3 or 4 spikelets on each side; secondary (or tertiary ?) spathes infundibular, similar to the primary but smaller, and not

bristly; spikelets short, 3 to 4 cm long, rather broad, with a zigzag-sinuous axis, and with only 4 or 5 alternate flowers, or pairs of flowers, on each side; spathes broad, concave, embracing the involucre, and produced at one side into a triangular point; involucrophore concave, quite sessile, attached laterally to the base of the spathe above its own; involucre shallowly, and, often, asymmetrically cupular, usually bidentate at one side. *Female flowers* ovate, 6 mm long, usually in pairs at each spathe in the lower part of the spikelets; in this case they are not accompanied by a neutral flower; near the end of the spikelets the female flowers are solitary, and the involucre bears a very depressed, lunate, sharply defined areola for the reception of the neuter flower. *Fruit*, when still very young, ventricose in the middle, narrowed at both ends, stoutly beaked and terminated by three, small, recurved stigmas. *Scales* in fifteen longitudinal series, not channelled along the middle, of a straw-yellow color in the posticous part and with a broad black marginal line, apices squarrose, slightly produced, and erosely-ciliate. *Seed* *Fruiting perianth* campanulate, narrowing to a rather acute base; the calyx split down past the middle into three broadly ovate lobes; the corolla barely longer than the calyx.

LUZON, Province of Cagayan, Laloc, in dense forests at about 50 m above the sea, *For. Bur.* 6649 Klemme, April, 1907.

A very singular species of the group of *C. palustris*, related to *C. Jenningsianus*, but quite distinct by its larger fruit and especially by its geminate flowers in the lower part of the spikelets. *N. v. arugda*.

***Calamus Jenningsianus* Becc. sp. nov.**

Scandens, mediocris, caudice vaginato circiter 2.5 cm diametro; vagina crebre spiculis parvis, brevibus (4-5 mm longis) armata; ocrea breviter ligulaeformi, glabra. Folia cirro robusto elongato terminata, petiolo 12 cm longo, supra plano et aculeis brevibus erectis consperso; segmentis non numerosis, aequidistantibus, 4-5 cm inter se dissitis, e basi acuta anguste elliptico-lanceolatis, acuminatis, 3-5-costulatis, intermediis 22-25 cm longis, 30-32 mm latis. Spadix foemineus breviusculus, caudiculo brevi terminatus; spathis primariis inferne tubulosis, superne apertis et in dorso acute carinatis, carina aculeata; spathis secundariis infundibuliformibus, laxe vaginantibus, spicis brevibus, 2-3 cm longis, scorpioideis, paucifloris; floribus utrinque 2 vel 3, alternis, spathellis infundibuliformibus. Fructus late ovoideo-elliptici, circiter 25 cm longi, 18 mm lati, squamis per orthostichas 12 ordinatis, crassiusculis, valde convexis et profunde in medio canaliculatis, stramineis, anguste nigro-marginatis; semine globoso, 11 mm diametro, undique extus minute foveolato, albumine profunde ruminato.

Scandent, of moderate size; sheathed stem apparently 2.5 cm in diameter. *Leaf-sheaths* rather densely armed with small, rigid, and short (4 to 5 mm long), horizontal spiculæ, which rest on bulbous bases. *Ocrea* shortly liguliform, glabrous. *Leaves* terminated by a robust

cirrus, and about 80 cm long in the pinniferous part, the petiole about 10 mm broad and 12 cm long (in one specimen), quite flat above, and here sprinkled with small and straight erect spines, convex, and smooth beneath, its margins acute and sparingly prickly, rachis flattish beneath, where only toward the summit it is armed with semiverticillate claws, the lower surface quite smooth, the upper surface of rachis prickly near the base but otherwise smooth and with a not very acute salient angle; the cirrus is strongly armed with $\frac{3}{4}$ -verticilled claws. *Leaflets* not very numerous, equidistant, rather remotely set (4 to 5 cm apart on each side); elliptic-lanceolate, broadest about their middle, and equally narrowing to both ends; gradually acuminate to an inconspicuously bristly tip, the base acute, rigid-papyraceous, green on both surfaces, but paler beneath than above, 3- or 5-costulate; the costæ very sharp above, smooth on both surfaces with the exception of 1 or 2 spinules, which are occasionally to be found at the base of the mid-costa on the upper surface; transverse veinlets minute, much interrupted, not very prominent, margins minutely spinulose near the apex, otherwise smooth. The intermediate leaflets are 22 to 25 cm long, 30 to 32 mm broad, the others somewhat smaller, but of the same form. *Male spadix* *Female spadix* apparently not very elongate, terminated by a short, tail-like appendix; primary spathes thinly coriaceous, those of the apical portion of the spadix (the others not seen by me) flattened, tubular in their lower part, enlarged above and open on the ventral side, terminated by a triangular, acuminate, acutely keeled point, the keel spinous; secondary spathes infundibuliform, rather loosely sheathing, unarmed, obliquely truncate and ciliate at the mouth, produced at one side into a short deltoid point; spikelets short, 2 to 3 cm long, scorpioid, rather thick, with very few (4 or 5 in all) alternate flowers; the spikelets of the lower part of the partial inflorescences probably longer and with a few more flowers. Spathels infundibuliform, obliquely truncate, very shortly produced into a rather broad triangular point at one side, obscurely dorsally keeled; involucrophore obliquely attached to the base of the spathe above its own, shallowly cupular, bidentate on the posticous or axial side; involucre shallowly cupular, with an irregular, undulate margin; areola of the neuter flower depressedly lunate, sharply bordered. *Fruit* broadly ovoid-elliptic, about 25 mm long, 18 mm broad, very suddenly and conspicuously beaked, scales arranged in 12 longitudinal series, relatively thick, strongly convex, deeply channelled along the middle, of a straw-yellow color, with a very narrow blackish marginal line, the point also blackish and very slightly produced. *Seed* globular, but not exactly spherical, about 11 mm in diameter, rather regularly and minutely foveolate all around, without a distinct chalazal fovea; albumen very deeply ruminated.

MINDORO, Mount Halcon, *For. Bur.* 4400 Merritt, June, 1906, altitude about 1,500 m. Named in honor of Lieut. T. H. Jennings who accompanied Mr. Merritt on his trip to Mount Halcon.

4. *P. corniculans* Nyl. Fl. (1885) 607.

Medulla thalli neque KHO, nec CaCl_2O_2 reagens, at his solutionibus unitis intense rubescens. Thallus isidiis et sorediis destitutus, margine bene ciliato. Apothecia perforata, margine plus minusve dentato ciliatoque, excipulo subtus laevigato aut rugoso.

LUZON, prov. Zambales, *For. Bur.* 8161 *Curran & Merritt*: prov. Benguet, mons Tonglon, *Bur. Sci.* 5489 *Ramos*. MINDORO, mons Halcon, *Merrill* 5738. Ad truncos arborum et in rupibus. Fert.

5. *P. Merrilli* Wain. sp. nov.

Thallus superne sordide albidus aut glaucescenti-albidus, praesertim centrum versus et ad margines etiam nigricanti-variegatus, intus albus, subtus totus ater aut raro partim ad ambitum pallidus, laciniis circ. 30–10 mm latis, irregulariter lobatis, lobis nonnullis apice rotundatis subintegrisque, ceterum margine profunde dentata et laciniata, dentibus lacinulisque saepe 1–10 mm longis, 0.3–0.8 (–1) mm latis, simplicibus aut furcatis, sat acutis aut apice angustato, planis aut superne convexis, sat laxae affixus, lobis saepe partim contortis at plus minusve imbricatis adscendentibusque, ceterum sat laevigatus, margine passim parce aut sat parce ciliato, ciliis 3–0.5 mm longis, nigris, simplicibus, sorediis et isidiis destitutus, subtus rhizinis brevibus, nigris passim parcissime instructus, KHO superne lutescens, intus leviter lutescens, CaCl_2O_2 non reagens, at his solutionibus unitis intus leviter rubescens. Apothecia mediocria, circ. 5–8 mm lata cupuliformia, subpedicellata aut sessilia, imperforata aut raro demum minute perforata, disco rufo aut testaceo-rufescente, nudo, opaco aut nitido, margine tenui, minute papilloso-denticulato aut parce lacinulato, haud ciliato, excipulo subtus sat laevigato aut leviter ruguloso. Hymenium circ. 0.1 mm crassum, ascis solis jodo caeruleiscentibus. Sporae 8-nae, distichae, simplices, decolores, ellipsoideae, long. 0.019–0.030, crass. 0.011–0.017 mm, membrana 0.003 mm crassa, exosporio et endosporio sat distincto, apicibus rotundatis. Conceptacula pycnoconidiorum thallo ambitum versus immersa, apice atro parum emergente. Pycnoconidia haud bene cognita (unum subbifusiforme, rectum, long. 0.007, crass. 0.0007 mm, inter sterigmata male evoluta vidi). Habitu similis est *P. disparili* Nyl., quae lacinulis subtus albidis et medulla CaCl_2O_2 non reagente et thallo ciliis destituto secundum specimen orig. n. 35103 in herb. Nyl. ab ea distinguitur.

LUZON, prov. Zambales, *Bur. Sci.* 5156 *Ramos*, *For. Bur.* 8177 *Curran & Merritt*: prov. Benguet, mons Tonglon, *Bur. Sci.* 5493 *Ramos*. MINDORO, mons Halcon, *Merrill* 6163, alt. 2400 m s. m. Ad truncos. Fert.

6. *P. coralloidea* (Mey. & Flot.) Wain. *Stud. Lich. Brés.* 1: 33.

Thallus isidiosus, medulla alba, KHO non reagente, CaCl_2O_2 rubescente.

MINDANAO, Castra Keithley prope lacum Lanao, cum *Clemens* 1319. Ad truncum arboris. Ster.

A very peculiar species belonging to the group of *C. palustris*, but with a seed having a ruminant albumen and with the leaflets equidistant, lanceolate, and 5-costulate. It is related to *C. Arugda*. Of this species I have seen only a leaf, the summit of a spadix, and a few fruits.

Calamus mindorensis Becc. in Philip. Journ. Sci. 2 (1907) Bot. 235.

This species was originally described from the female plant only. Male specimens have now been collected, also in MINDORO, by M. L. Merritt, in June, 1907, *For. Bur.* 6217. It is a commercial rattan. Native name *tumalin*.

It is a very high-scandent plant. The specimen seen by me has a sheathed stem 5 cm in diameter. The leaves are about 2 m long and terminate in a very robust cirrus; the petiole is almost obsolete; the leaflets are as already described (*l. c.*) Male spadix forming a large, compound and diffuse panicle, 2 m in length, glabrous in all parts, divided into several triple-branched, partial inflorescences; primary spathes thinly coriaceous, greenish-yellow, tubular, tightly sheathing, smooth; the first spathe is 15 cm long, and about 3 cm broad, flattened, two-edged, the edges very sharp and spinous above, horizontally truncate and fringed with paleaceous scales at the mouth, prolonged at one side into an elongate, triangular, dorsally-keeled and spinous point. The partial inflorescences are flexuous, very long and slender, one, belonging to the lower part of the panicle, is 1.2 m in length, with its axial part 5 to 6 mm thick at the base and with about 12 branches, distically inserted on each side; secondary spathes tubular, tightly sheathing, 3 to 4 cm long, smooth, entire, truncate and also ciliate at the mouth, and prolonged at one side into a triangular acute point; the secondary branches are inserted outside the mouth of their respective spathes, and have a distinct axillary callus, they are slender, flexuous, 2 to 2.5 mm thick, 30 cm long, or thereabouts, and bear numerous distichously arranged spikelets; the tertiary spathes are smooth, elongate-infundibuliform, 10 to 15 mm long, truncate and ciliate at the mouth like the others, prolonged at one side into a triangular point which subtends their respective spikelets. The spikelets are spreading, arched, usually 2 cm long, or at times shorter, comb-like, bearing about 20, very approximate, exactly bifarious flowers on each side, and when measured with the flowers are about 6 mm broad; spathelets very short, very closely packed, concave and almost boat-shaped, obtuse, and deflexed; involucre formed by two concave bracteoles united by their bases, and immersed in their respective spathelets which contribute with the involucre to form a small cup to their respective flowers. Flowers in contact one with the other, the full grown buds 2.5 to 3 mm long, cylindraceous, apiculate; the calyx has 3, deltoid, acute, deeply striate teeth; the corolla is twice as long as the calyx.

Calamus trispermus Becc. in Perkins Fragm. Fl. Philip. (1904) 46, et in Ann. Bot. Gard. Calcutta 11: tab. 180.

Of this species, which was described from very incomplete material, I have seen recently in the Kew Herbarium, a fine specimen with an entire fruiting spadix,

a portion of the stem, and an entire leaf from a full-grown plant; it was collected by A. Lohr at Montalbain, Province of Rizal, Luzon, in February, 1908, (No. 7071 in Herb. Kew.).

It is a scandent and robust species. The sheathed stem is 5 to 6 cm in diameter and the naked canes are 2.5 cm thick. The *leaf-sheaths* are rather thick and woody, more or less covered with tobacco-colored, very appressed and almost immersed scales, and are strongly gibbous above, obliquely truncate at the mouth, which is entire, has a sharp margin and is more or less furnished with spines; they are also armed, especially in their upper part and above the gibbosity, with rather robust, scattered, horizontal, short (5 to 10 mm long) spines, which have a broad base and leave on the surface of the sheath a very distinct impression of their form; this is concave on the lower and convex on the upper surface; the ligule is represented by a short rim inside the mouth of the sheath. The *leaf* is about 2.2 m long in the pinniferous part and terminates in a rather long, very robust cirrus; the petiolar part is very short, 2.5 cm broad at its base, flattish and covered with small, erect prickles above, rounded and smooth beneath, its margins more or less prickly; the rachis is flattish and also prickly above in its first portion, but higher up becomes convex, and towards the extremity has an obtuse, salient angle; beneath it is slightly convex, more or less covered with rusty scales, and armed toward the upper extremity of the pinniferous part with at first solitary, then ternate, and finally half-whorled very robust claws; on their cirrus the half or the three-quarter whorls are regularly spaced every 3 to 4 cm. The *leaflets* are about 30 on each side, rather regularly alternate and equidistant, 3 to 6 cm apart, and toward the end even more; they are rigidly papyraceous, green, smooth on the nerves and concolorous on both surfaces, somewhat concavo-convex, lanceolate or elliptic-lanceolate, acuminate, the tip bristly; the medial leaflets are 30 cm long, or thereabout, and 5 to 7 cm broad; those of the extremities are smaller, all are 5-costulate, with a few secondary, rather distinct nerves interposed between the costae; transverse veinlets very crowded and numerous; the margins spinulose near the base, the spinules gradually passing into rigid, spreading hairs near the apex. The *spadix* is rather diffuse, 70 cm in length, slightly nodding, with a rather rigid axis and only 4 or 5 partial spreading inflorescences. The primary spathes are tightly sheathing, fugaciously rusty-furfuraceous, elongate-infundibuliform, armed with small, short claws in their upper part; the lower spathe is 20 cm long, 18 cm broad at the mouth, flattened, very sharply two-edged, entire and obliquely truncate at the mouth, which is fringed with small, rusty paleolæ, and is produced at one side into a triangular, acutely keeled point; the other primary spathes are entire, 10 cm long, narrowing toward the base, where they are flat, with sharp margins on the inner side, and are prolonged at the apex into a triangular, acutely keeled point. The partial inflorescences are 20 to 35 cm in length, have only 3 or 4

spikelets on each side, and terminate in a small, angular, tail-like appendix. The *spikelets* are 7 to 12 cm long, otherwise as already described (*l. c.*).

The type specimen of *C. trispermus* (Merrill 1645, Herb. Manila) differs from that collected by Loher only in the more elongate spikelets; while the discrepancies which may be noted in the descriptions of the leaves of the two, are due to the fact that the leaf of Loher's specimen is one from the upper part of a full-grown plant, where the leaves have almost equidistant leaflets; while the leaf of Merrill's specimen was a non-cirriforous one, probably from the lower part of the stem, or that of a young plant, where apparently the leaflets are approximate in pairs.

Calamus microcarpus Becc. in Records Bot. Surv. India 2: 213 et in Ann. Bot. Gard. Calc. 11: tab. 218.

This species, described by me from Vidal 3952, has been again collected by Loher, (Herb. Kew.), at Montalban, Province of Rizal, Luzon, in 1905, and again in MINDANAO, Camp Keithley, Lake Lanao, by Mrs. Mary Strong Clemens, in October, 1907.

An entire leaf of Loher's specimen measures 1.1 m in the pinniferous part, has a rather long petiole, and terminates in a long, rather slender cirrus, which is armed with half whorls of very acuminate claws. The intermediate leaflets are 25 to 30 cm long, 14 to 15 mm broad, and are very distinctly approximate in several groups; they have the mid-costa very prominent, but the side nerves are not so strong as in Vidal's specimen, are quite smooth on the under surface, and have only a few spinules on a nerve on each side of the mid-costa above; the margins are minutely and appressedly spinulose. (In Vidal's type specimen the leaflets have rigid bristles on 3 nerves above, and the margins are spreadingly spinulose.) The *spadix* is 55 cm in length; the *spathes* are conspicuously inflated, and the upper ones not prickly. The *fruits* are ovoid, 8 mm long (without the perianth) and 6 mm broad, otherwise as already described.

Mrs. Clemens' specimen has a *spadix* apparently longer and more robust than those collected by Loher and Vidal, and the fruits are also slightly larger. In fact, in Mrs. Clemens' specimens, the fruits, when completely mature, are almost globular, or subobovoid-globular, with a short obtuse and relatively large beak, 7 mm through, and 10 mm in length, not including the small perianth which is distinctly pedicelliform. The seed is globular, slightly depressed and 6 mm broad, otherwise as already described.

Calamus microsphaerion Becc. in Perkins Fragm. Fl. Philip. (1904) 45 et in Ann. Bot. Gard. Calcutta 11: tab. 204.

I consider as belonging to this species a sterile specimen, collected by W. I. Hutchinson in the Moro Province, Mindanao, in July, 1906. (*For. Bur. No. 4818*). N. v. *pudlus*.

Calamus Diepenhorstii (Miq.) var. *exulans* Becc. var. nov.

This possesses a great likeness to some Malayan forms in the spinescence of the leaf-sheaths, in the extraordinary length of the spadices and in all other principal characteristics; it differs only in the leaflets, which are without bristles on the

mid-costa above, but beneath have the mid-costa closely bristly and the side nerves naked. In the Malayan forms the leaflets have long bristles on 3 nerves beneath, the mid-costa being smooth, while the mid-costa above is bristly. The female spikelets of this variety are also less distinctly zigzag-sinuous, the involucre of the flower does not form so regular and deep a cup as in the type and the areola of the neuter flower is crescent-shaped and not roundish. Otherwise the similarity of the Philippine variety to the Malayan type is very evident.

The male plant was collected by *F. W. Foxworthy* in March, 1906, on Mount Victoria, PALAWAN, (*Bur. Sci. No. 756*), and the female by *Loher*, in Luzon, at Montalban, Province of Rizal, March, 1906; (*No. 7045* in *Herb. Kew.*). *N. v. palimanan.*

The male specimen has a leaf 1.5 m long; the leaflets are numerous, equidistant, subtricostulate, the mid-costa is rather prominent, above bristly-spinulose near the apex, the side costae with long bristles; underneath the mid-costa is furnished with bristles, and the side nerves are naked. The male spadix is, as in the species, extraordinarily long, and not essentially different from that of the Malayan type; but the secondary and tertiary branches and the spikelets are inserted just at the mouth of their respective spathes, and these terminate in a broad, horizontal or deflexed point. The male flowers also are slightly smaller, more approximate, inserted at a wider angle, and therefore have the spathes shorter and less distinctly infundibuliform.

In *Loher's* (female) specimen the sheathed stem is 3 cm in diameter; the leaf-sheaths are strongly gibbous above, and densely armed with horizontal rows of confluent, triangular, laminate, black spines, which have a lighter-colored sharply defined base. An entire leaf has a petiolar part 15 cm long, its total length being 1.18 m; the petiole has prickly margins; the rachis is armed beneath with a line of single claws along the center, and with a similar line on each side. The leaflets are numerous, equidistant, almost equally green on both surfaces; the medials 30 to 35 cm long, 16 to 18 mm broad, rather distinctly 3-costulate, their mid-costa on the upper surface is smooth, or has a few small spinules near the apex, the side costulae are slender, and also have a few straggling spinules; underneath the mid-costa is rather closely bristled, and the side nerves are usually naked, but on these also a few setiform spinules may sometimes be observed. The spadix is 6 (!) meters long (in one specimen), including the slender, terminal, very minutely and closely clawed cirrus, simply decomposed, with a few, very distant, partial inflorescences, exactly as in the type, but with the spathes more thickly set with prickles, the secondary and tertiary spathes are also set with minute prickles in their upper part; the spikelets are 15 to 18 cm long, very slightly zigzag-sinuous; with up to 15 or 16 flowers on each side; the involucre is slightly cupular; and the areola of the neuter flower is crescent-shaped, with sharp margins. The fruit is wanting.

Calamus Merrillii Becc. in Webbia 1 (1905) 67 et in Ann. Bot. Gard. Calcutta 11: tab. 167.

To this species is referable a fine fruiting specimen with an entire spadix collected by *Loher* at Montalban, Province of Rizal, Luzon, July, 1905, (No. 7076 in Herb. Kew.).

Of this specimen the sheathed stem is 6 to 7 cm in diameter. The fruiting spadix is robust, nodding, 1.3 m long, including a terminal, tail-like, flattened, subulate appendix, which is formed of several tightly sheathing, smooth, or slightly prickly spathes; it is divided into 8 gradually diminishing, spreading, and arched partial inflorescences, of which the largest (which are also the lowest) are 35 to 40 cm in length. The lowest spathe is strongly flattened, 3 to 3.5 cm broad, two-edged (the edges sharp and without spines), 16 to 17 cm long, very tightly sheathing, slightly obliquely truncate at the mouth, and very sparingly armed with a few straight small spines; the other primary spathes are tubular, more or less longitudinally split, obliquely truncate at the mouth, prolonged above at one side into an acuminate, dorsally keeled point, and bearing irregularly distributed, small, broad-based, and subbulbous horizontal prickles. The largest partial inflorescences carry 10 to 13 spikelets on each side and terminate in a small smooth tail-like appendix; the secondary spathes are truncate at the mouth, and prolonged at one side into a broad triangular point; they are either quite smooth or have at most one or two rudimentary or tuberculiform prickles. The spikelets are 8 to 9 cm in length, slightly flattened, 8 mm broad between the spathelets (not taking into account the flowers). Fruit spherical, with a rather thick and blunt beak on the top, about 12 mm in diameter. Leaves as already described (in Ann. Bot. Gard. Calcutta l. c.); the rachis in the lower and intermediate parts is rather deeply channelled above; leaflets 3 to 3.5 cm apart on each side, with bristles which may reach 3 cm in length.

The type specimens of *C. Merrillii* were *Merrill* 1893 from Bosoboso, Province Rizal, Luzon, male plant, and *Loher* 1361 (Herb. Kew.), in fruit.

Calamus Merrittianus Becc. in Philip. Journ. Sci. 2 (1907) Bot. 233.

I refer to this species specimens collected at Camp Keithley, Lake Lanao, MINDANAO, by *Mrs. Mary Strong Clemens*, in June, 1907, (Nos. 1112 and 1124); they differ, however, from the type plant found by *Merritt* in MINDORO, (*For. Bur.* 3912), in the spathes being less densely set with prickles; therefore presenting a transitional form between *C. Merrittianus* and *C. Merrillii*. Perhaps *C. Merrittianus* is only a geographical variety of *C. Merrillii*.

Calamus grandifolius Becc. sp. nov.

Robustus et scandens, caudice vaginato 4 cm diametro; vagina tenuiter lignosa, densissime spinis nigris tenuissimis, 25-30 mm longis, armata; ocrea breviter ligulaciformi, hispida. Folia ampla, 1.7 m in parte pinifera longa, cirro robusto valde aculeato terminata; petiolo robusto,

25 cm longo, 20–22 mm lato, superne planiusculo et spinis brevibus erectis armato; segmentis numerosis, aequidistantibus, rigide papyraceis, utrinque nitidis, e basi acuta latiuscule lanceolatis, acuminatis, majoribus 40–42 cm longis, 4–5.5 cm latis. Spadix foemineus circiter 50 cm longus, rigidus, strictus, erectus, in paucas (4 in specimine uno) parvas sensim decrescentes inflorescentias partiales divisus et caudiculo inerme terminatus; spathis primariis tubulosis, in ore barbato-hispidis, inflorescentiis basilaribus 7–8 cm longis, utrinque spicis 3 vel 4 praeditis; spathis secundariis infundibuliformibus, apice setosis, spicis brevibus et crassiusculis, 2–3.5 cm longis, paucifloris; floribus biseriatis, sursum versis, e basi plana et 5 mm lata, late conoideis.

Apparently large and scandent. *Sheathed stem* about 4 cm in diameter. *Leaf-sheaths* strongly gibbous above, woody, very densely armed with very slender and scattered, elastic, very narrowly laminiform and sometimes bristle-like, blackish, shining, unequal spines, of which the largest are 25 to 30 mm long. *Ocrea* shortly liguliform, axillary, fringed with long and rigid bristles. *Leaves* very large (in one specimen the pinniferous part is 1.7 m long) terminated by a very robust, strongly clawed cirrus; petiole about 25 cm long, 20 to 22 mm broad, flat at the base above and convex beneath; upwards flattened and biconvex, covered, especially on the upper surface, with short, ascendent spines, these spines also covering the first portion of the rachis; on the margins the spines are not longer than elsewhere; the rachis is armed beneath (from the base upward) first with solitary, then with 2- or 3-nate, and at the extremity with half-whorled, very robust claws; on the upper surface the rachis is convex-bifacial with a smooth salient angle; leaflets numerous, alternate, equidistant, 5 to 7 cm apart (on each side), rigidly papyraceous, shining on both surfaces, rather broadly lanceolate, narrowing from below the middle to a rather acute base, very gradually acuminate to a bristly tip; the intermediate ones 40 to 42 cm long, 4 to 5.5 cm broad; the mid-costa is slender, but sharp above, and has 4 or 5 or at times more, slender, unequal secondary nerves on each side of it; all nerves smooth on both surfaces; transverse veinlets very close together and very sharp; margins remotely and appressedly spinulose. *Male spadix*
Female spadix rigid, strict, erect, short (50 cm long in one specimen), apparently appressed to the stem, with a very short (3 cm long), 15 mm broad, almost unarmed, much flattened pedicellar part, which gradually passes into the first spathe. The *spadix* bears only four small, gradually decreasing partial inflorescences, which are inserted inside the mouths of their respective spathes and are covered in every part with a brown scaly scurf. The primary spathes are tubular, minutely and appressedly furfuraceous at the mouth with stiff, black, shining bristles; the lowest spathe much flattened, two-keeled, the keels bearing rather long, subbristly spines; the upper spathes somewhat inflated, carinate and spinous on the

back, terminated by a short triangular point; the lowest partial inflorescences are the largest, they are 7 to 8 cm long with only 3 or 4 spikelets on each side; secondary spathes infundibuliform, truncate at the mouth and slightly prolonged at one side, furnished at the summit with a few long stiff bristles; *spikelets* short and rather thick, 2 to 3.5 cm long, with two series of 6 or 7, assurgent, not flatly bifarious flowers; spathels very shortly infundibuliform, embracing the involucre, involucrophores and involucre (which are very much alike) very shallowly cupular and orbicular; areola of the neuter flower depressedly lunate and sharply bordered. *Female flowers* conical, 5 mm long and 5 mm broad; the form of the flower being given by the calyx, which has a very broad, flat, callous base, and a very contracted, shortly 3-toothed mouth; the teeth about as long as the small segments of the corolla; stigma small, triangular, spreading.

LUZON, Province of Laguna, Mount Banajao, *Loher* 7088, February, 1906, (Herb. Kew.). N. v. *saba-ang*.

A very singular species, easily distinguishable by its short, straight, rigid female spadix, with the spathes fringed at the mouth by numerous stiff subspiny bristles and also by its large leaves and lanceolate leaflets. It would seem by its short spadix, with its gradually decreasing subinflated spathes, to belong to the group of *C. siphonopathus*, but it has a quite peculiar habit. The spadix is also very much like that of *C. dimorphacanthus*, but the leaves are quite different, and are very similar to those of *C. ornatus*. The spadix was detached, nevertheless I entertain little doubt but that it belonged to the same plant as the leaves described above.

Calamus dimorphacanthus Becc. in Records Bot. Surv. India 2: 214 et in Ann. Bot. Gard. Calcutta 11: tab. 219.

Specimens corresponding to the type were collected by A. D. E. Elmer on Mount Santo Tomas (Tonglon), Province of Benguet, LUZON, in May, 1904, No. 6238.

In these specimens the spadix bears almost mature fruits not differing from those of the type; but the partial inflorescences are more robust, the largest being 12 cm in length, and with the lowest spikelets forked; the primary spathes are fugaciously rusty-furfuraceous, of these the lower are more or less prickly, the upper smooth. The fruits are 8 to 10 mm long. The leaflets are narrow, and are furnished with rather long bristles on the mid-costa above; their margins are ciliate with rather spreading hairs. *C. dimorphacanthus* appears to be a very polymorphous species, including several distinct varieties or subspecies.

Calamus dimorphacanthus var. *montalbanicus* Becc. var. nov.

The specimen upon which I have established this variety is remarkable for the extraordinary spinescence of the leaf-sheaths and especially of the ocrea, which moreover, is extraordinarily developed. The sheathed stem is 3 cm in diameter; the leaf-sheaths are densely armed with laminate flexible, schistaceous or almost black, unequal spines, the largest being 20 to 25 mm long; the ligule is 15 cm long (in one specimen), papyraceous

and very rigid, very densely beset by very unequal, horizontal, and often subseriate, or confluent spines, otherwise similar to those occurring on the leaf-sheaths. *Leaves* 1.2 m long in the pinniferous part, and terminated by a robust and strongly clawed cirrus; leaflets linear, very numerous and closely set, equidistant, naked underneath, and furnished above on the mid-costa, and on one nerve on each side of it, with a few, but relatively robust, subspiny bristles; the margins are rather closely and appressedly spinulose; the petiole, which is 15 cm long, and the rachis, are both strongly armed above with unequal spines; the medial leaflets are 19 to 20 cm long, and 8 to 10 mm broad. *Male spadix* about 40 cm in length, narrowing gradually to a tail-like tip, with 7 or 8 tubular, gradually diminishing, shortly imbricate, primary spathes. Male partial inflorescences short and dense.

The type specimen of this variety (a male plant in the Kew Herbarium) was collected by A. Lohr in May, 1905, on the summit of Mount Batay at 1,380 m elevation, near Montalban, Province of Rizal, Luzon, (No. 7085 in Herb. Kew.).

The variety differs from the type by its leaf-sheaths being very densely spinose, by its large, very rigid and also densely spinose ligule, and by its very narrow 3-nerved leaflets, the 3 nerves bearing bristles on the upper surface. In the type the ligule is membranaceous, brittle, and much less spinose, and the leaflets are bristly only on the mid-costa above, while the hairs on the margins are more spreading.

***Calamus dimorphacanthus* var. *zambalensis* Becc. var. nov.**

A more robust plant than the type. Sheathed *stem* 4 cm in diameter and perhaps at times more; naked canes 2.5 cm in diameter, with a light-straw-colored very polished surface; *leaf-sheath* very densely spinose as in the other forms; ligule not so long as in the type, densely covered with spiculæ. Petiole robust and short, very densely spinose; the leaflets are very numerous, very closely set, rigid, or papery-subcoriaceous, narrowly lanceolate; the medial ones 20 cm long or thereabouts, and 15 to 20 mm broad, naked beneath, and furnished above on the mid-costa with rigid, subspiny bristles; the side nerves are smooth; the margins are conspicuously ciliate with spreading spinules; the cirrus is, as usual in this species, robust and armed with half-whorls of strong and tumescent claws. *Fruiting spadix* 55 cm long in one specimen; primary spathes rather densely spinulose; partial inflorescences short, having few branches and these with few spikelets, which are rigid and thickish; spathelets and involucrophore as in the other forms; involucre distinctly discoid, orbicular, flat or slightly convex. *Fruit* larger than in type, globose-ovoid, 13 mm long, about 10 mm broad, borne on a short but distinctly pediceliform, cylindraceous, fruiting perianth; scales shining, arranged in 15 longitudinal series, slightly furrowed along the middle, brown with a darker uniform margin all around, the point blunt.

LUZON, Province of Zambales, Mount Tapulao, *For. Bur.* 8412 Curran & Merritt, December, 1907, on exposed peaks in the elfinwood, altitude about 2,000

m, very abundant locally and the only species of the genus in the locality according to the collectors.

Prospectus of the varieties of *Calamus dimorphacanthus*:

1. Ligule membranous, brittle, armed with few spinules, leaflets very narrow, bristly only on the mid-costa above, margins ciliated with spreading, spinuliform hairs. Fruit 8 to 10 mm long forma *typica*
2. Ligule very long (as much as 15 cm) rigid, very densely armed with horizontal, more or less seriate spines; leaflets very numerous, narrow, bearing above, on the mid-costa, and on one nerve on each side of it, several subspiny bristles; margins ciliated with rather robust spreading spinules.

var. *montalbanicus*.

3. Ligule relatively short, bristly-spinulous; leaflets very closely set, very stiff and thickish, narrowly lanceolate, furnished with conspicuous subspiny bristles only on the mid-costa above, margins ciliated with spreading spinules. Fruit larger than in type (13 mm long, 10 mm broad).

var. *zambalensis*.

Calamus halconensis Becc. sp. nov.

Scandens, mediocris, vaginis densissime spinis laminaribus, inaequalibus, creberrime plus minusve seriatis ac basi confluentibus armata; ligula rigide elongata, densissime spinoso-hispida. Frondium petiolo breviusculo (7-8 cm longo), spinis inaequalibus armato; parte pinnifera circiter 1 m longa; cirro validissimo aculeis reduncis robustis semiverticillatis armato; segmentis numerosis, aequidistantibus, ensiformibus, 20-25 cm longis, 13-15 cm latis, subtus levibus, supra in costa media et secus nervos 2 setosis; marginibus crebre adpressequ ciliato-spinulosis. Spadix fructifer circiter 30 cm longus, spathis levibus; inflorescentiis partialibus parvis et parce ramosis. Fructus ovati vel subobovati, obtusissime mucronati, una cum perianthio fructifero, distincte pedicelliformi, 17 mm longi, 12 mm lati; squamis per orthostichas 12 ordinatis, nitidis, luride stramineis, apice rotundatis, in medio profunde sulcatis; semine ovato, 10.5 mm longo, 7 mm lato, grosse alveolato-sulcato et in dorso longitudinaliter sculpto.

Scandent, of moderate size. *Leaf-sheaths* very densely armed with very unequal, laminate, more or less closely seriate, confluent spines; ligule rigid, 5 to 6 cm long, entirely covered, in one specimen, with very rigid, needle-like spiculae of unequal length. *Leaves* with the petiole armed with the same kind of unequal spines as in *C. dimorphacanthus*, 7 to 8 cm long, the pinniferous part apparently about 1 m in length, terminated by a very robust, strongly clawed cirrus; leaflets numerous, equidistant, ensiform, or very narrowly lanceolate, 20 to 25 cm long, 13 to 15 mm broad, smooth underneath, sprinkled above on the mid-costa and on one nerve on each side of it, with not very rigid bristles; margins rather closely and appressedly spinulous. *Fruiting spadix* about 30 cm long, with smooth spathes, and very few, small, slightly branched, partial inflorescences, of which the lowest are only 5 cm in length and have very few spikelets. *Fruit* ovoid or subobovoid, obtusely beaked, 17 mm

long, including the perianth, 12 mm broad; scales in 12 longitudinal series, polished, of a dirty straw color, with a paler, narrow, scarious margin, deeply furrowed in the middle quite to the point, and almost gibbous, their apices blunt and with a blackish spot. *Seed* ovoid, 10.5 mm long, 7 mm broad, broadly pitted and irregularly grooved, rather deeply furrowed on the raphe side, and without a chalazal fovea.

MINDORO, Mount Halcon, *For. Bur. 4399 Merritt*, June, 1906, in forests at about 1,500 m altitude.

I have seen of this plant only a very incomplete specimen of the leaf-sheath and leaves, an entire spadix, and a few fruits; and these were detached from the spadix, although to all appearances, they really belonged to it. In the vegetative organs, *Calamus halconensis* does not, apparently, differ from some forms of *C. dimorphacanthus*, but the fruit is of different type, and resembles more that of *C. microcarpus*.

Calamus Vidalianus Becc. in *Records Bot. Surv. India* 2: 212 et in *Ann. Bot. Gard. Calcutta* 11: *tab. 211*.

This, which was an imperfectly known species described by me from *Vidal 938* (*Herb. Kew.*), has been rediscovered by *A. Loher* at Montalban, Province of Rizal, Luzon, March, 1906, (*No. 7087* in *Kew Herbarium*).

In *Loher's* specimen the sheathed stem is 2 cm in diameter, the leaf-sheaths are greenish or purplish-green, gibbous above, feebly armed with very small, straight, broad-based spines, 2 to 3 mm long; the mouth is truncate and fringed with scales and few spinules. One leaf is 1.6 m long in the pinniferous part, and terminates in a rather long, robust, and strongly clawed cirrus; the petiole is quite obsolete; the leaflets are about 30 on each side, rather approximate and equidistant in the lower part of the rachis, more distant and somewhat irregularly arranged above; the medials are 30 to 32 cm long and 20 to 25 mm broad and are usually furnished, near the base of the mid-costa on the upper surface, with 1 or 2 spinules; these are more robust than some which stand higher up; one nerve on each side of the mid-costa is also more or less spinulose, but occasionally a single nerve on one side only is so; underneath all nerves are naked; the rachis on the upper surface of its lower portion, is armed with unequal, erect spines, which disappear higher up, where the rachis is bifacial, with the salient angle very obtuse; underneath, the rachis is smooth in its basal part but toward the end is armed with claws, which are single at first, then geminate, and are finally set in half-whorls. The spadix is erect, diffuse, 90 cm long, with only 4 or 5 partial inflorescences on each side, and terminates in a short tail-like prickly appendix; the lowest spathe is flattened, two-edged, 12 cm long; all the other primary and secondary spathes are fringed at the mouth with small paleolæ; the lower partial inflorescences are 30 to 35 cm long with 7 or 8 spikelets on each side; the upper are shorter, and have fewer spikelets. The lower spikelets are 5 to 6 cm long, and have 10 to

12 flowers on each side; the upper are shorter and bear fewer flowers. The spikelets in Loher's specimen are therefore somewhat more slender, and bear a few more flowers than those of Vidal's *No. 938*, but are otherwise identical with them.

Calamus Blancoi Kunth Enum. Pl. 3 (1841) 595; Becc. in Webbia 1 (1905) 66, Ann. Bot. Gard. Calcutta, 11: t. 64.

A specimen with a female spadix collected near Zamboanga, MINDANAO by W. I. Hutchinson (*For. Bur.* 4819), July, 1906, does not differ from other specimens that I have seen from Luzon and from Leyte; it is therefore apparently a constant form, although closely allied to *Calamus mollis* Blanco.

Calamus discolor (Mart.) var. *negrosensis* Becc. var. nov.

A specimen of a *Calamus* collected by F. Danao in NEGROS, apparently belongs to a distinct variety of the form which I have recently described in Elmer's "Leaflets" as typical *C. discolor*. The specimen consists only of the upper part of the leaf, and of a few partial inflorescences of a male spadix. There is not however all the requisite evidence to prove that this specimen really represents the male plant of *C. discolor*, although the male spadix of the type, and the female one of this proposed variety are unknown; the leaf, however, of the plant from Negros, with its leaflets white beneath, though endowed with some peculiarities of its own, leaves little doubt as to its specific identity with or at least of its great affinity to *C. discolor*.

It is a high-climber. *Leaf-rachis* rusty-furfuraceous; leaflets very numerous, equidistant, very narrowly linear-lanceolate, broadest at about their middle, green above and white beneath, exactly as in the type, from which, however, they differ in being smaller, and in having a few bristles on the mid-costa above only, while the under surface is sprinkled all over, except at the base, with scattered, small, spadiceous, subspiny bristles; the largest leaflets, i. e., the medials, are 20 to 22 cm long, and 9 to 10 mm broad. *Male spadix* apparently rather large, with several partial inflorescences; each of these forming rather dense panicles, 20 to 30 cm long, twice branched, covered with a soft detachable whitish scurf on the spathes and spathels; secondary spathes infundibuliform, rather loosely sheathing; branches 10 to 12 cm long, or at times less, bearing a few gradually decreasing branchlets, which carry 4 to 6 distichously arranged spikelets on each side; the spikelets are inserted at the mouth of their respective spathes, are 2 to 3 cm long, flattened, comb-like, with perfectly bifarious, horizontal, contiguous flowers; the axes of the spikelets are slender, not brittle; spathes very short, concave, apiculate at one side, very strongly and firmly striately veined; involucre cupular, obliquely truncate, 2-dentate on the axial side. *Flowers* small, ovoid; the calyx sharply and firmly striately-veined like the spathes, with 3 acute teeth.

NEGROS, Province of Negros Occidental, Cadiz, *For. Bur.* 12432 Danao, March 10, 1908, altitude about 50 m above the sea. N. v. *limoran*.

DAEMONOROPS BL.

Daemonorops Margaritae (Hance) var. **palawanicus** Becc. var. nov.

It is the first and only species of *Daemonorops* of the group of *Cymbospatha* to be discovered in the Philippine Islands. I have referred it to *D. Margaritae*, a species indigenous to southern China, from which it differs in the seed, which is more or less globular, and obsoletely 3-gonous, and can not be called reniform, as that of *D. Margaritae* is described as being.

PALAWAN, near Iwahig, *Bur. Sci.* 899 Foxworthy, May, 1906.

Daemonorops ochrolepis Becc. var. **radulosus** var. nov.

This differs from the "forma typica" in the petiole, and the first portion of the rachis, being densely prickly on both surfaces; the upper salient angle of the rachis is also spinulose throughout to the end of the pinniferous part.

Luzon, Province of Tayabas, Mauban, *For. Bur.* 10190 Curran, March, 1908. I also refer here a specimen collected at Camp Keithley, Lake Lanao, MINDANAO. Mrs. Clemens 898, January, 1907, the fruits globose-ovoid, 15 mm in diameter (very immature), and also Loher 7078, male specimen, from the Province of Rizal, Luzon, April, 1905.

Daemonorops Curranii Becc. in Philip. Journ. Sci. 2 (1907) Bot. 238.

To this species must be referred an unnumbered specimen collected by Mrs. Mary Strong Clemens in MINDANAO, Camp Keithley, Lake Lanao, September, 1907; it differs however from the type which was collected by Curran in PALAWAN (*For. Bur.* 3791), in the leaflets which have 5 bristly nerves above instead of 3, and in the pedicellar part of the spadix which is entirely covered with stiff bristles, which unite in their basal part to form several callous, suberistate bodies; the fruit and the seed, seem also to be more ovoid in the Mindanao than in the Palawan plant.

Daemonorops Clemensianus Becc. sp. nov.

Scandens, caudicibus vaginatis circiter 2 cm diametro; vaginae undique spinis tenuibus nigrescentibus breviter seriatis obsessis et in ore spinis numerosis laminaribus crebre imbricatis, valde elongatis (8–12 cm longis, 2–4 mm latis) armatae, frondium petiolus circiter 25 cm longus, biconvexus, circum et ad margines spinis rectis armatus; rhachis supra levis; cirrus gracilis; pars pinnifera circiter 1–3 m longa, segmentis numerosis, subaequidistantibus 2.5–3.5 cm inter se remotis, lineari-ensiformibus, supra secus nervos 3 spinulosis, subtus in costa media tantum setis longiusculis praeditis; segmentis intermediis 40–42 cm longis, 13–15 mm latis. Spadix masculus 50–60 cm longus, strictus, parte pedicellari 6–10 cm longa et dense spiculifera suffultus; spathis primariis in apicem deltoideum spiculiferum productis; spatha extima spiculis fasciculatis plus minusve praedita; floribus masculis circiter 4 mm longis, calyce breviter cyathiformi. Spadix foemineus rigidus, parte pedicellari spiculis densis et basi confluentibus ac callosis praeditus, in plurimas approximatas inflorescentias partiales, 10–15 cm longas, divisus; spicis majoribus 5–7 cm longis, utrinque 7- vel 8-floris; involucrophoro obconico, 3–4 mm longo. Fructus majusculi, sphaerici, breviter lateque rostrato mamillati, 22–24

mm diametro, squamis per 18 orthostichas ordinatis, stramineis, anguste nitideque longitudinaliter sulcatis; semine irregulariter globoso, 16–17 mm diametro, minute tuberculoso et alveolato; fovea chalazae superficiali, punctiformi, indistincta.

MINDANAO, Lake Lanao, Camp Keithley, Mrs. Clemens 1227, September, 1907.

Related to *D. ochrolepis* but easily distinguishable from this by its very narrowly ensiform leaflets, and larger fruit, which are about the size of those of *D. calapparius*, and among the largest in the whole genus.

Daemonorops Loherianus Becc. sp. nov.

Scandens, caudicibus vaginatis 2.5 cm diametro; vaginae spiculis nigrescentibus, 5–10 mm longis, irregulariter oblique seriatis, armatae, in ore nudae et inermes; frondium petiolus circiter 25 cm longus, valde biconvexus, marginibus acutis, utrinque spinis ascendentibus obsessus; rachis superne spinulosa; cirrus elongatus gracilis; pars pinnifera circiter 1.3 m longa; segmentis numerosis aequidistantibus approximatis, angustissime lanceolatis, apice acuminato-subulatis; intermediis 20–23 cm longis, 14–18 mm latis, supra secus nervos tres crebre setosis, subtus costa media tantum setis longis sparsa. Spadix masculus inapertus, elongatus, angustus, teres, 45 cm longus, 12 mm diametro, erectus, parte pedicellari brevissima dense spinosa praeditus; spathis primariis 7 vel 8, per gradus sensim decrescentibus; spatha basilari acute bicarinata et secus carinas spiculis parvis radiatim fasciculatis praedita, apice rostro tenui spinuloso terminata, caetero inermi, spathis superioribus etiam rostratis et apice spiculiferis, caeterum levibus. Flores masculi pro rata valde elongati et angustissimi (8–10 mm longi, 1 mm crassi); calyce tubuloso, cylindraceo, breviter 3-dentato; corolla calyce triplo longiori, phyllis striatis, angustissimis, acuminatis. Spadix foemineus et fructus desiderantur.

LUZON, Province of Rizal, Siya bundoc, Loher 7073, June, 1905, in Kew Herbarium.

It is apparently related to the species of the group of *D. lamprolepis* of the *Piptospatha* division. It is well characterized by the strongly biconvex petiole, and more especially by the very slender and unusually long male flowers, the tubular calyx, and also by the mouth of the leaf-sheaths being quite smooth and entirely devoid of spines, bristles, or other kind of fringe.

ILLUSTRATIONS.

EXPLANATION OF THE PLATES.

PLATE XXX. *Normanbya Merrillii* Becc. A tree cultivated in Manila, showing habit. Photograph by Martin.

XXXI. *Normanbya Merrillii* Becc. Fig. 1, fruit, with the epicarp removed, showing the fibers of the mesocarp; fig. 2, seed as seen from the raphal side; fig. 3, seed, side view; fig. 4, seed, longitudinal section; fig. 5, the same in cross section; fig. 6, male flower in bud; fig. 7, male flower with one petal removed; fig. 8, fruiting perianth as seen from above; fig. 9, the same, side view. All figures twice natural size.



PLATE XXX.—NORMANBYA MERRILLI BECC.

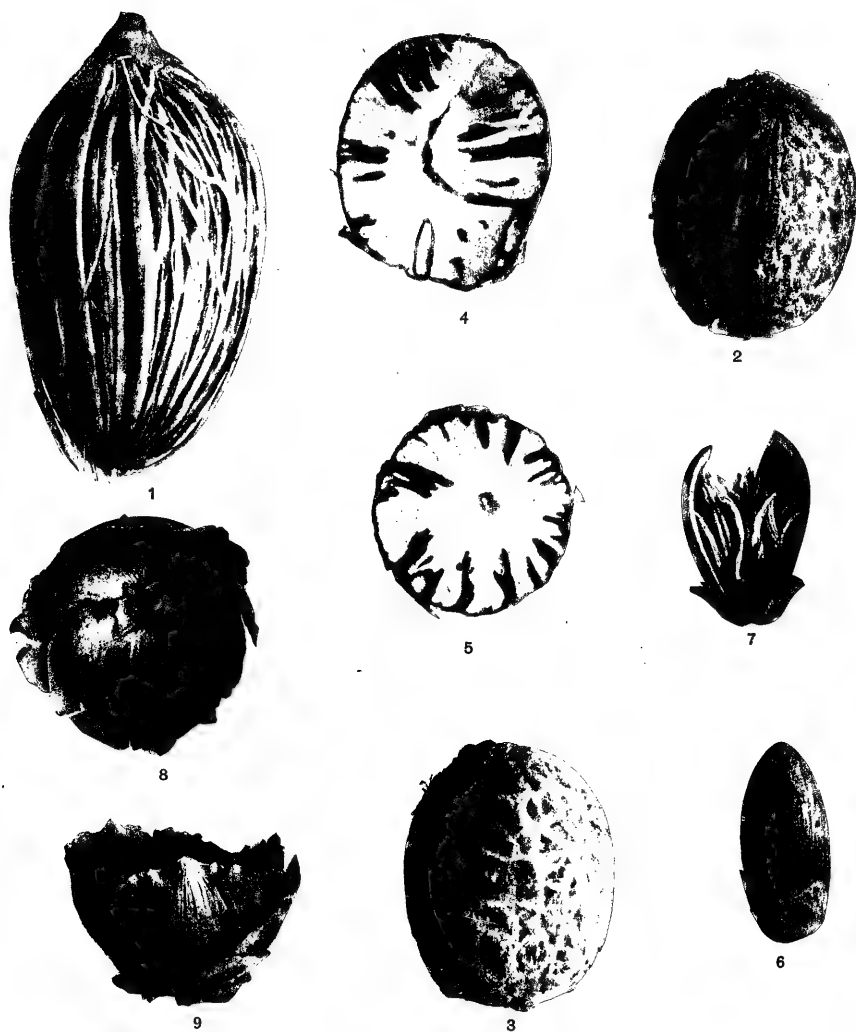


PLATE XXXI.—NORMANBYA MERRILLI BECC.

A PRELIMINARY REVISION OF PHILIPPINE COMBRETACEÆ.

By E. D. MERRILL.

(From the Botanical Section of the Biological Laboratory, Bureau of Science,
Manila, P. I.)

This small group has been worked over chiefly with a view to clearing up some points connected with the genus *Terminalia*, some species of which are of importance from a forestry standpoint, as the timber is at least locally utilized to a greater, or less extent. Four years ago I published a key to the Philippine species of *Terminalia*,¹ recognizing eleven species, the same number that is recognized in the following consideration, although several of the species admitted in the previous paper have been shown by additional material to be invalid, and have here been reduced. In the interim a single new species has been described, and a second one is proposed below. Some changes in nomenclature have also become necessary, and a few of the specimens previously referred to certain species, due to misinterpretation of these, have now been referred to their proper ones. Additional material is required to thoroughly work out the relationships of the forms in the section *Bialata*, *Terminalia calamansanai* (Blanco) Rolfe, and related forms, while as yet the flowers of *Terminalia quadrialata* are unknown. *T. magarapali* Vid., a very distinct species, judging from the very short description, has not as yet been rediscovered.

Table showing the distribution of Indo-Malayan, Chinese, Formosan, and Philippine Combretaceæ.

Genera.	Philippines.	Formosa.	China.	Malay Peninsula.	Malay Archipelago.	British India.
Anogeissus						4
Calycopteris				1		1
Combretum	4		2	10	11	18
Lumnitzera	2	1		2	2	2
Quisqualis	1	1	1	2	2	3
Terminalia	11	1	1	8	10	12
Total	18	3	4	23	25	40

¹ Publications of the Bureau of Government Laboratories 17 (1904) 31-36.

KEY TO THE GENERA.

Petals none, calyx-limb deciduous; trees..... 1. *Terminalia*
 Petals 4 or 5.

Calyx-limb persistent; leaves alternate; trees of the mangrove swamps.

2. *Lumnitzera*

Calyx-limb deciduous; scandent shrubs.

Flowers small, the calyx-tube above the ovary less than 1 cm long.

3. *Combretum*

Flowers rather large, the calyx-tube above the ovary 4 to 6 cm long.

4. *Quisqualis*

1. *TERMINALIA* Linn.

Fruit ovoid, oblong, or elliptic, sometimes compressed, never winged, but in some species keeled at the edges. § CATAPPA.

Fruit ellipsoid, strongly compressed and keeled, about 5 cm long.... 1. *T. catappa*

Fruit oblong, very slightly compressed and keeled, about 10 cm long.

2. *T. magarapali*

Fruit slightly compressed, hardly keeled, 1.5 cm long or less; leaves glandular-punctate 3. *T. edulis*

Fruit not at all compressed or keeled.

Inflorescence of paniculate spikes..... 4. *T. comintana*

Inflorescence of simple spikes; leaves glandular-punctate and with glands in the axils of the nerves; petioles usually with from 1 to 3 glands.

Spikes rather strongly pubescent; leaves 10 to 18 cm long; fruits ellipsoid or ovoid, not or very obscurely apiculate, about 5 cm long.

5. *T. oöcarpa*

Spikes glabrous; leaves 7 to 12 cm long; fruits oblong-ovoid and strongly apiculate or ovoid and scarcely apiculate, 4 cm long or less.

Petioles and midribs usually somewhat pubescent, the former with 3-1, or no glands near the apex; fruits less than 2.5 cm long.

6. *T. pellucida*

Leaves entirely glabrous, very strongly shining and usually dark-brown when dry, the petioles usually with two glands at about the middle; fruits about 4 cm long, strongly apiculate..... 7. *T. nitens*

Fruit elliptic or narrowly elliptic, its edges produced into two broad, coriaceous wings. § BIALATA.

Inflorescence, young branches, petioles and under surfaces of the leaves softly ferruginous-pubescent; fruit, including the wings, 6 cm wide.... 8. *T. blancoi*

Leaves glabrous beneath..... 9. *T. calamansanai*

Fruit equally or subequally 2-3-4-winged, the wings less than 5 mm wide; leaves ovate-elliptic to orbicular-elliptic; spikes panicled..... 10. *T. polyantha*

Fruit equally 4-winged, the wings submembranaceous, 1 to 1.3 cm wide; leaves oblong-obovate to elliptic-obovate, 15 to 25 cm long..... 11. *T. quadrialata*

1. *Terminalia catappa* Linn. Mant. (1771) 519; Hook. f. Fl. Brit. Ind. 2 (1878) 444; F.-Vill. Nov. App. (1880) 80; Merr. in Govt. Lab. Publ. (Philipp.) 17 (1904) 35.

T. latifolia Blanco Fl. Filip. (1837) 376, non Sw.

T. mauritiana Blanco l. c. ed. 2 (1845) 264, ed. 3, 2: 126, non Lam.

Throughout the Philippines at low altitudes, especially near the sea, and somewhat cultivated as a shade tree. India to Malaya and Polynesia; planted in most tropical countries.

Native names *Talisay* or *Dalisay* in most Philippine dialects; Sp.-Fil. *Almendras*, corresponding to the "Indian almond" of English speaking people in the east.

Terminalia polyantha Presl, which was previously reduced by me to this species from the abridged description given by Miquel, is in no way allied to *T. catappa*. The specimen reported as *T. catappa* from Mangsi Island, by A. Gray in the "Botany of the Wilkes U. S. Exploring Expedition", is *T. littoralis* Seem., and was doubtless wrongly localized on the label, as the species is a Polynesian one. The sterile specimen reported also by Gray "from a small island in the Sooloo Sea" as *T. glabrata* Forst.?, may have been *T. catappa*, but I have seen no specimen.

2. *Terminalia magarapali* Vidal Sinopsis Atlas (1883) XXIV, t. 48, fig. C; Merr. in Govt. Lab. Publ. (Philip.) 17 (1904) 35.

T. procera F.-Vill. Nov. App. (1880) 80, non Roxb.

ALABAT ISLAND, *vide* Vidal, specimen no longer extant, locally known as *Magarapali*.

This species should prove to be a very distinct one, characterized especially by its very large fruits, which are about 10 cm long. It has not as yet been collected a second time.

3. *Terminalia edulis* Blanco Fl. Filip. ed. 2 (1845) 265, ed. 3, 2: 127; Vidal Rev. Pl. Vasc. Filip. (1886) 127; Merr. in Govt. Lab. Publ. (Philip.) 17 (1904) 33. *Terminalia angustifolia* Blanco l. c. ed. 1 (1837) 377, non Jacq.

Pentaptera mollis Presl Epim. Bot. (1852) 214.

Terminalia mollis Rolfe in Journ. Bot. 23 (1885) 312; Vid. Phan. Cuming. Philip. (1885) 112, Rev. Pl. Vasc. Filip. (1886) 127.

Terminalia belerica F.-Vill. Nov. App. (1880) 80; Vidal Sinopsis Atlas (1883) t. 48, fig. B, non Roxb.

Luzon, Province of Cagayan, *For. Bur.* 11275 Klemme, *For. Bur.* 14761, 14814 Darling, *For. Bur.* 17132 Curran; District of Bontoc, *For. Bur.* 17030 Curran; District of Lepanto, *Bur. Sci.* 7017 Ramos; Province of Ilocos Sur, *For. Bur.* 7116 Klemme; Province of Nueva Ecija, *For. Bur.* 8430, 8471 Curran; Province of Nueva Vizcaya, *For. Bur.* 14862, 14867 Darling; Province of Zambales, *For. Bur.* 5990, 6330 Curran, Merrill 2968; Province of Pangasinan, Cuming 1004 (cotype of *Pentaptera mollis* Presl); Province of Bulacan, *For. Bur.* 11187 Aguilar; Province of Rizal, *For. Bur.* 1887, 3411 Ahern's collector, Merrill 1626, 2283, *Bur. Sci.* 2033 Ramos; Province of Bataan, Ahern 306, *For. Bur.* 1387, 1652 Borden; Province of Tayabas, *For. Bur.* 10 Ware, *For. Bur.* 6049 Kobbe, Merrill 2588, *For. Bur.* 10226, 10356, 10386 Curran; Province of Camarines, *For. Bur.* 10484, 10779 Curran, Ahern 1. MINDORO, *For. Bur.* 4481, 7142, 8848, 9882 Merritt. PALAWAN, *For. Bur.* 5187, 7421 Manalo. MASBATE, *For. Bur.* 12818, 12657 Rosenbluth, Merrill 2759. GUIMARAS, *For. Bur.* 296 Gamill. MINDANAO, *For. Bur.* 9412, 9488 Whitford & Hutchinson.

Native names: *Calupi*, *Calusit*, *Alupi* (Cagayan); *Calautit* (Ilocos); *Sacat*, *Calamansali* (Nueva Ecija); *Calaotit* (Nueva Vizcaya); *Calumpit* (Zambales, Bataan, Rizal, Tayabas, Mindoro); *Bisal* (Bulacan); *Gayumayen* (Zambales); *Calumagon*, *Cotmoc* (Camarines); *Buranis* (Palawan); *Magtalisay*, *Calumanog* (Masbate); *Tayataya* (Guimaras).

A widely distributed endemic species, yielding the timber commercially known as *Calumpit*. With the abundant material cited above, I am no longer able to distinguish *Terminalia mollis* (Presl) Rolfe from *T. edulis* Blanco. Young specimens of Blanco's species have exactly the same type of pubescence as has Presl's.

and a number of specimens among those above cited show both softly pubescent leaves and branchlets, and other more mature perfectly glabrous leaves on the same branches. Mature plants are nearly glabrous throughout.

4. *Terminalia comintana* (Blanco) Merr. in Philip. Journ. Sci. 4 (1909) Bot. 300.

Bucida comintana Blanco Fl. Filip. (1837) 866, ed. 2 (1845) 265, ed. 3, 2: 48.

Terminalia chibula F. Vill. Nov. App. (1880) 80, non Retz.

Terminalia multiflora Merr. in Govt. Lab. Publ. (Philip.) 17 (1904) 34.

This species is widely distributed in the Philippines, extending from northern Luzon to Mindanao. For numerous specimens representing the species, see those cited by myself *l. c.* Additional material is represented by the following:

LUZON, Province of Cagayan, *For. Bur.* 18480 *Alvarez*: Province of Ilocos Sur, *For. Bur.* 13028 *Paraiso*: Province of Nueva Ecija, *For. Bur.* 14319 *Saroca*.
LEYTE, *For. Bur.* 12766 *Rosenbluth*.

Native names: *Lasila*, *Lasilac* (Cagayan, Ilocos); *Banglas* (Nueva Ecija); *Bingas* (Zambales); *Magtalopoi* (Pangasinan); *Naghubo*, *Palauag*, *Saplungan* (Rizal); *Dinglas* (Batangas); *Bangias* (Tayabas, Mindoro); *Tiroron* (Camarines); *Malatagum* (Zamboanga); *Batitinan* (Zambales, Zamboanga); *Batitinan-babay* (Ticao); *Bongas*, *Bungas* (Leyte).

Terminalia polyantha Presl, reduced to this species by me, with doubt, belongs in a different section of the genus.

(Celebes).

5. *Terminalia oöcarpa* Merr. in Govt. Lab. Publ. (Philip.) 17 (1904) 32, Philip. Journ. Sci. 1 (1906) Suppl. 103, sphalm. *ovocarpa*.

Terminalia ellipsoidea Merr. *l. c.* 33.

Terminalia pellucida Merr. *l. c.* pro parte.

LUZON, Province of Cagayan, *For. Bur.* 17176 *Curran*: Province of Ilocos Norte, *For. Bur.* 13880 *Merritt & Darling*: Province of Rizal, *Merrill* 1829, *For. Bur.* 2992 *Ahern's collector*: Province of Bataan, *For. Bur.* 1216, 2075 *Borden*, *Whitford* 347, *Williams* 687, *For. Bur.* 67 *Barnes* (type), *For. Bur.* 2249, 2579 *Meyer*: Province of Tayabas, *Merrill* 1943, 1951, 1952, 2846, *For. Bur.* 14 *Ware*, *Whitford* 820, *For. Bur.* 10275 *Curran*, *For. Bur.* 11512 *Whitford*: Province of Camarines, *For. Bur.* 10634 *Curran*, *Ahern* 52. MINDORO, *For. Bur.* 3699, 11388 *Merritt*, *Whitford* 1470, *Merrill* 2148 (type of *Terminalia ellipsoidea* Merr.).

Native names: *Dalinsi* (Tayabas, Camarines); *Sacat* (Cagayan, Bataan); *Talisay del monte* (Bataan); *Talisay gubat* (Mindoro); *Calutit* (Ilocos); *Mapatad* (Rizal); *Calumpit* (Tayabas, Mindoro); *Balinsil* (Infanta); *Malagabi* (Mindoro).

This species is closely allied to *Terminalia pellucida* Presl, but is distinguished by its larger leaves, much larger fruits, and pubescent spikes. The abundant material now available has lead me to reduce *Terminalia ellipsoidea*, as the characters on which that species was based, do not appear to be constant.

Endemic.

6. *Terminalia pellucida* Presl Epim. (1852) 214; Vidal Phan. Cuming. Philip. (1885) 112, Rev. Pl. Vasc. Filip. (1886) 127; Merr. in Govt. Lab. Publ. (Philip.) 17 (1904) 35.

LUZON, Province of Zambales, *For. Bur.* 11049 *Zschokke*, *Merrill* 1755, 2105, 2901: Province of Pangasinan, *Cuming* 1039 (cotype), *For. Bur.* 8268 *Curran & Merritt*, *For. Bur.* 14351 *Villamil*: Province of Pampanga, *For. Bur.* 5923 *Curran*. Two specimens from PALAWAN, *Bur. Sci.* 752 *Fowworthy*, *For. Bur.* 4157 *Curran*, may be referable here.

Native names: *Solo-solo* (Pampanga); *Sobo-sobo* (Zambales); *Saguet* (Zambales, Pangasinan); *Sacut*, *Aritongtong*, *Hakit* (Zambales).

Endemic.

7. *Terminalia nitens* Presl Epim. (1852) 214; Vid. Phan. Cuming. Philip. (1885) 112, Rev. Pl. Vasc. Filip. (1886) 127; Merr. in Govt. Lab. Publ. (Philip.) 17 (1904) 33, Philip. Journ. Sci. 1 (1906) Suppl. 103.

Terminalia belerica var. *laurinoides* F.-Vill. Nov. App. (1880) 80, non Clarke.

LUZON, Province of Cagayan, *Cuming* 1326 (cotype): Province of Ilocos Norte, *For. Bur.* 13958 *Merritt & Darling*: Province of Ilocos Sur, *For. Bur.* 13023, 13048 *Paraiso*: Province of Zambales, *Hallier*, *For. Bur.* 6001, 5911 *Curran*, *For. Bur.* 8313 *Curran & Merritt*, *For. Bur.* 9608, 9611 *Zschokke*: Province of Rizal, *Merrill* 2800, *For. Bur.* 10033 *Curran*, *Bur. Sci.* 2034 *Ramos*: Province of Batangas, *For. Bur.* 7634 *Curran & Merritt*: Province of Bataan, *For. Bur.* 1205, 1547, 1562, 1619, 1738, 3058 *Borden*, *For. Bur.* 2241 *Meyer*, *For. Bur.* 64 *Barnes*, *Whitford* 393, *Bur. Sci.* 1565 *Fowworthy*: Province of Tayabas, *For. Bur.* 15264 *Rosenbluth*. MINDORO, *Whitford* 1479, *For. Bur.* 7148 *Merritt*. PALAWAN, *For. Bur.* 4494 *Curran*. MASBATE, *For. Bur.* 12594 *Rosenbluth*, *Whitford* 1691. MINDANAO, District of Zamboanga, *For. Bur.* 9240, 9241, 9166 *Whitford & Hutchinson*.

Native names: *Sacut* (Bataan, Rizal, Tarlac, Mindoro, Batangas); *Dalinsi* (Tayabas); *Daminsil*, *Malagabi* (Mindoro); *Magtalisay* (Masbate); *Mantalisay* (Zamboanga); *Calautit*, *Calactit*, *Anaguep* (Ilocos).

The last three species form a group of closely allied forms, but which are distinguishable, I believe, by the characters indicated in the key. The present species is usually distinguishable by its leaves being dark-brown and very shining when dry, a character in which it differs strongly from the other two.

Endemic.

8. *Terminalia blancoi* sp. nov. § *Bialata*.

Terminalia mollis Merr. in Govt. Lab. Publ. (Philip.) 17 (1904) 34, non Presl.

Arbor usque ad 20 m alta, ramulis junioribus, foliis subtus, petiolis, inflorescentiis, fructibusque ferrugineo-pubescentibus; foliis chartaceis vel subcoriaceis, elliptico-ovatis vel elliptico-obovatis, acuminatis, basi acutis, usque ad 18 cm longis, nervis utrinque circiter 10, distinctis, petiolo usque ad 4 cm longo; spicis simplicibus, axillaribus, foliis aequilongis; floribus 5-meris; fructibus 3 cm longis, late 2-alatis, cum alis 6 cm latis.

A tree 20 m high or less. Branches terete, brownish, the growing tips thickened, ferruginous-pubescent, and with numerous petiolar scars, the flowers and spikes crowded at the apices. Leaves chartaceous or subcoriaceous, elliptic-ovate to elliptic-obovate, 9 to 18 cm long, 5 to 10 cm wide, the base acute or acuminate, often slightly inequilateral, the apex acuminate, the upper surface glabrous, or the midrib sometimes pubescent, brown when dry and slightly shining, the lower surface paler, usually rather densely and softly ferruginous-pubescent, the pubescence persisting on specimens bearing mature fruits; nerves about 10 on each side of the midrib, distinct, obscurely anastomosing, the ultimate reticulations fine, brown, distinct; petioles 1.5 to 4 cm long, usually with three or four glands, these sometimes wanting. Spikes axillary, solitary, simple, crowded with the leaves at the apices of the branches, about as long as

the leaves, very densely ferruginous-pubescent. Flowers 5-merous, the calyx densely pubescent inside and out, about 4 mm in diameter, the lobes reflexed in anthesis, ovate. Stamens 10. Fruits ovate, slightly pubescent, 3 cm long, including the two coriaceous rounded wings 6 cm wide.

Luzon, Province of Rizal, Merrill, *Decades Philippine Forest Flora* 2 (type), 207 Ahern's collector, *For. Bur.* 3254 Ahern's collector, *Bur. Sci.* 1069 Ramos, Merrill 2835: Province of Benguet, Twin Peaks, *Elmer* 6395.

This species is probably the form mentioned by Blanco in the original description of *Gimbernatia calamansanai*, as differing from the original form, which was collected in Laguna Province by Azaola, in its broader fruits, *G. calamansanai* having fruits (including the wings) "mas de una pulgada de ancho y media de alto," while the other form mentioned has fruits up to two and one-half inches wide. The specimens cited above seem to represent a form that is constantly distinct from typical *Terminalia calamansanai*, recognizable by its much larger leaves, larger fruits, and its pubescence. All the sheets from Rizal Province bear the native (Tagalog) name *Calamansacat*.

9. *Terminalia calamansanai* (Blanco) Rolfe in Journ. Linn. Soc. Bot. 21 (1884) 310; Vidal Rev. Pl. Vasc. Filip. (1886) 127; Merr. Govt. Lab. Publ. (Philip.) 17 (1904) 35.

Gimbernatia calamansanai Blanco Fl. Filip. ed. 2 (1845) 266, ed. 3, 2: 129.

Terminalia alata F.-Vill. Nov. App. (1880) 80, non Kürz.

Terminalia parviflora Merr. in Govt. Lab. Publ. (Philip.) 17 (1904) 36, non Presl.

This species presents several forms, which may eventually prove to be of specific rank when more material is available for study and comparison. The typical form is represented by specimens bearing fruits (including the wings) about 4 cm wide, and 2 cm long, as in the following specimens:

Luzon, Province of Zambales, Merrill 2981, *For. Bur.* 5839 Curran: Province of Bataan, Ahern 785. MINDANAO, Province of Surigao, Ahern 329. *For. Bur.* 6960 Curran, specimen in flower, from Zambales, is probably also referable here.

Not being satisfied that the following two forms are specifically distinct, they are here indicated as varieties of *T. calamansanai*:

Var. *platypteris* var. nov.

Differt a typo fructibus majoribus, cum alis circiter 2.5 cm longis, 7 ad 8 cm latis.

Luzon, Province of Zambales, Subic, *For. Bur.* 371 Maule, March, 1904, locally known as *Subo-subo*.

Var. *acuminata* var. nov.

Differt a typo et var. praecedente fructibus longioribus, cum alis 3 ad 3.5 cm longis, 5 ad 5.4 cm latis.

Luzon, Province of Tayabas (Principe), Merrill 1067, August–September, 1902. Endemic.

10. *Terminalia polyantha* Presl Epim. (1852) 213; Vidal Phan. Cuming. Philip. (1885) 112, Rev. Pl. Vasc. Filip. (1886) 128.

Terminalia parviflora Presl l. c. 214; Vidal l. cc.

Luzon, Province of Zambales, *For. Bur.* 6950, 6986, 6989, 6990 Curran: Province of Batangas, Cuming 1439 (cotype of *Terminalia parviflora*). MINDORO, Cuming 1516 (cotype of *Terminalia polyantha*).

This species, although remarkably uniform in vegetative and floral characters, shows some variation in its fruits, which have from two to four wings, one of the Cuming specimens showing 2- and 3-winged fruits on the same plant. From an examination of cotypes of both of Presl's species, before me, I am unable to distinguish them, and hence have included both under the first specific name. In my first consideration of Philippine *Terminalia*² both of the species described by Presl were misinterpreted, as neither the original descriptions of the species, nor cotype material was then available in Manila. *T. polyantha* was reduced to *T. catappa*, to which it is not at all closely allied, while the specimen referred to *T. parviflora* does not represent that species. Later³ *T. polyantha* was referred by me with doubt to *T. comintana*, which it resembles strongly in its inflorescence, and closely in its leaves, but which has entirely different fruits.

Endemic.

11. *Terminalia quadrialata* Merr. in Philip. Journ. Sci. 4 (1909) Bot. 301.

This species is represented by a number of specimens from southern Luzon, Masbate, and Samar, but the flowers are as yet unknown. It is apparently universally known as *Toog* in the regions in which it is found.

Endemic.

EXCLUDED SPECIES.

TERMINALIA ARJUNA Bedd.; F.-Vill. Nov. App. (1880) 80.

An Indian form, not known from the Philippines, and doubtless listed by F.-Villar through a misconception of the species.

2. LUMNITZERA Willd.

Racemes axillary; flowers white; stamens as long as the petals..... 1. *L. racemosa*
Racemes terminal; flowers scarlet; stamens twice as long as the petals.

2. *L. littorea*

1. *Lumnitzera racemosa* Willd. in Ges. Naturf. Fr. Neue Schr. 4 (1803) 187; DC. Prodr. 3 (1828) 22; Clarke in Hook. f. Fl. Brit. Ind. 2 (1878) 452; Miq. Fl. Ind. Bat. 1¹ (1856) 606; F.-Vill. Nov. App. (1880) 81; King in Journ. As. Soc. Beng. 66² (1897) 334; Vid. Synopsis Atlas (1883) t. 48, fig. G. Rev. Pl. Vasc. Filip. (1886) 128.

Petaloma alba Blanco Fl. Filip. (1837) 344, ed. 2 (1845) 240, ed. 3, 2: 82; Naves l. c. ed. 3, t. 126.

LUZON, Province of Tayabas, *For. Bur.* 10334 Curran, April, 1908. CEBU, *Bur. Sci.* 1718 McGregor, September, 1906.

Native names *Culasi* (Tag.), ex Blanco; *Labau* (Tag.).

In mangrove forests, apparently not very common in the Philippines. India to Formosa, the Malay Peninsula and Archipelago, Madagascar, tropical Australia, and Polynesia.

2. *Lumnitzera littorea* (Jack) Voigt Hort. Suburb. Calcut. (1845) 39; Kurz Forest Fl. Brit. Burma 1 (1877) 469.

Pyrranthus littoreus Jack Mal. Miscel. 2 (1822) 57.

Laguncularia purpurea Gaudich. Voy. Uranie (1826) 481, t. 104.

Lumnitzera purpurea Presl Repert. 1 (1834) 155; Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee (1901) 468; Merr. in Forest. Bureau (Philip.) Bull. 1 (1903) 155.

² Publications of the Bureau of Government Laboratories 17 (1904) 31-36.

³ This Journal 4 (1909) Botany 300.

Lumnitzera coccinea W. & A. Prodr. 1 (1834) 316; Miq. Fl. Ind. Bat. 1¹ (1856) 606; Clarke in Hook. f. Fl. Brit. Ind. 2 (1878) 452; F.-Vill. Nov. App. (1880) 80; Vid. Rev. Pl. Vasc. Filip. (1886) 128; King. in Journ. As. Soc. Beng. 66² (1897) 334.

Petaloma coccinea Blanco Fl. Filip. (1837) 345, ed. 2 (1845) 240, ed. 3, 2: 83.

LUZON, Province of Cagayan, *For. Bur.* 7083 Klemme: Province of Zambales, Merrill 2082, *For. Bur.* 5888 Curran, *Bur. Sci.* 4722 Ramos: Province of Tayabas, Merrill 2483, 2065, *For. Bur.* 10234, 10386, 10250 Curran, (Principe) Merrill 1146: Province of Sorsogon, *For. Bur.* 10596 Curran. MINDORO, Merrill 2395, *For. Bur.* 5427, 9807, 9892 Merritt. CULION, Merrill 583. PALAWAN, *Bur. Sci.* 266 Bermejos, *For. Bur.* 3511 Curran, *Bur. Sci.* 614 Fowcorthy. MASBATE, *For. Bur.* 12669 Rosenbluth, *For. Bur.* 1004 Clark. NEGROS, *For. Bur.* 15013 Diehl, *For. Bur.* 5603 Everett. DINAGAT, Ahern 441. BASILAN, *For. Bur.* 4020 Hutchinson. MINDANAO, Province of Surigao, Ahern 501; District of Davao, Copeland 1323; District of Zamboanga, *For. Bur.* 9345, 9436 Whitford & Hutchinson.

Native names: *Carifurog* (Negrito, Cagayan); *Lebato*, *Pasasic*, *Libato*, *Agnaya*, *Aguia*, *Calapini*, *Culasi*, *Anilay*, *Colisiman* (Tag.); *Tabao*, *Duloc-duloc*, *Buloc-buloc*, *Saga-sa*, *Maoro* (Vis.); *Panting-panting* (Moro).

In mangroves and beach forests throughout the Philippines, abundant. India to the Malay Peninsula and Archipelago to New Guinea, tropical Australia, and Polynesia. *Lumnitzera pedicellata* Presl of the Marianne and Marshall Islands is doubtfully distinct.

3. COMBRETUM Linn.

Calyx-tube less than 3 mm long.

All parts glabrous or nearly so..... 1. *C. acuminatum*

Inflorescence and calyx-tubes very densely lepidote..... 2. *C. squamosum*

Calyx-tube elongated, at least 5 mm long.

Flowers in elongated spikes, the calyx-tubes only slightly puberulent.

3. *C. extensum*

Flowers densely arranged at the ends of the panicle-branches, the calyx-tubes rather densely puberulent 4. *C. confusum*

1. *Combretum acuminatum* Roxb. Hort. Beng. (1814) 28, Fl. Ind. 2 (1832) 228; Clarke in Hook. f. Fl. Brit. Ind. 2 (1878) 455; Vidal Phan. Cuming. Philip. (1885) 112, Rev. Pl. Vasc. Filip. (1886) 128; F.-Vill. Nov. App. (1880) 81.

SAMAR, Cuming 1681.

The range given for this species by Clarke, *l. c.*, is from the Transgangetic Peninsula from Assam to Singapore, Ceylon, Madras Peninsula?, Malaya to the Philippines, but he may have included more than typical *Combretum acuminatum* Roxb. in his conception of the species. King⁴ does not include the species in his "Materials for a Flora of the Malayan Peninsula" as occurring in the area covered by that work, nor does he mention it in his discussions of the accepted species. As I have only a fragment of Cuming's specimen, and no Indian material for comparison, I am constrained to accept Clarke's identification of Cuming's specimen for the present. The Philippine specimen seems, however, to differ from Roxburgh's species, as described, in being quite glabrous.

As to the name of the species, Kurz⁵ accepts *Combretum costatum* Roxb., which has page priority over *C. acuminatum* Roxb.

⁴ Journ. As. Soc. Beng. 66² (1897) 335-341.

⁵ Forest Flora of British Burma 1 (1877) 465.

2. *Combretum squamosum* Roxb. Hort. Beng. (1814) 28, Fl. Ind. 2 (1832) 231; Miq. Fl. Ind. Bat. 1^a (1856) 607; Clarke in Hook. f. Fl. Brit. Ind. 2 (1878) 456; F.-Vill. Nov. App. (1880) 81; Vid. Phan. Cuming. Philip. (1885) 112, Rev. Pl. Vasc. Filip. (1886) 128; Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 103; King in Journ. As. Soc. Beng. 66² (1897) 339.

Combretum squamosum var. *luzonicum* Presl Epim. (1852) 216.

Combretum distillatorium Blanco Fl. Filip. (1837) 295.

Combretum laxum Blanco l. c. ed. 2 (1845) 206, ed. 3, 2: 22; F.-Vill. Nov. App. (1880) 81, non Roxb.

LUZON, Province of Ilocos Sur, *Cuming 1122*: Province of Zambales, *Hallier s. n.*: Province of Nueva Ecija, *For. Bur. 8504 Curran*: Province of Pangasinan, *Bur. Sci. 4831 Ramos*: Province of Rizal, *Bur. Sci. 5 Foxworthy, Merrill 1840, For. Bur. 1995 Ahern's collector*: Province of Bataan, *Whitford 1032, For. Bur. 2304, 2173 Meyer, Elmer 6715, For. Bur. 2341, 2338 Borden*. CULION, *Merrill 604*. PANAY, *Copeland s. n.* BASILAN, *Hallier s. n.*

Northern and eastern Bengal to Nepal, Chittagong, the Malay Peninsula and Archipelago.

3. *Combretum extensum* Roxb. Hort. Beng. (1814) 28, Fl. Ind. 2 (1832) 229; Clarke in Hook. f. Fl. Brit. Ind. 2 (1878) 458; King in Journ. As. Soc. Beng. 66² (1897) 337; Merr. in Philip. Journ. Sci. 4 (1909) Bot. 300.

PALAWAN, Mount Pulgar, *Bur. Sci. 547 Foxworthy*. MINDORO, *For. Bur. 4074 Merritt*.

India to the Andaman Islands, the Malay Peninsula, and Java.

4. *Combretum confusum* Merr. & Rolfe in Philip. Journ. Sci. 3 (1908) Bot. 116.

Combretum scabratum Merr. l. c. 1 (1906) Suppl. 212, pro parte.

LUZON, Province of Rizal, *For. Bur. 3130 Ahern's collector, Bur. Sci. 4607 Ramos*.

An endemic species, closely allied to and possibly not specifically distinct from *Combretum sundaicum* Miq. of the Malay Peninsula and Sumatra.

EXCLUDED SPECIES.

C. WALLICHII DC.; F.-Vill. Nov. App. (1880) 81.

C. OVALIFOLIUM Roxb.; F.-Vill. l. c.

C. MICROPETALUM DC.; Llanos in Mem. Ac. Cienc. Madr. 4 (1859) 502.

C. ROTUNDFOLIUM DC.; Llanos l. c.

None of the above species are represented by extant Philippine botanical material, and all were doubtless credited to the Archipelago through misconceptions of the species by F.-Villar and Llanos.

4. QUISQUALIS Linn.

Quisqualis indica Linn. Sp. Pl. ed. 2 (1762) 556; Presl Rel. Haenk. 2 (1830) 25; Blanco Fl. Filip. (1837) 361, ed. 2 (1845) 254, ed. 3, 2: 109; Hook. f. Fl. Brit. Ind. 2 (1878) 459; F.-Vill. Nov. App. (1880) 81; Vid. Cat. Pl. Prov. Manila (1880) 30, Synopsis Atlas (1883) t. 48, f. D, Phan. Cuming. Philip. (1885) 112, Rev. Pl. Vasc. Filip. (1886) 128; Miq. Fl. Ind. Bat. 1^a (1855) 610; King in Journ. As. Soc. Beng. 66² (1897) 342; Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 103, 3 (1908) Bot. 422.

Q. spinosa Naves in Blanco Fl. Filip. ed. 3, t. 133.

Q. malabarica F.-Vill. Nov. App. (1880) 81, non Bedd.

Q. densiflora F.-Vill. l. c. non Wall.?

BABUYANES, Camiguin Island, *Bur. Sci.* 3958 *Fénix*. LUZON, Province of Cagayan, *For. Bur.* 18610 *Klemme*, *Bur. Sci.* 7930 *Ramos*: Province of Isabela, *Bur. Sci.* 3127 *Mearns*, *For. Bur.* 18582, 18587 *Alvarez*, *Bur. Sci.* 8069 *Ramos*: Province of Zambales, *Merrill* 1746, *Cuming* 1197: Province of Nueva Ecija, *Merrill* 276: Province of Bataan, *For. Bur.* 1497 *Ahern's collector*, *Bur. Sci.* 952 *Mangubat*, *Whitford* 39, 1287: Manila, *Normal School* 169 *Nuñez*: Province of Rizal, *For. Bur.* 2907 *Ahern's collector*, *Merrill* 1676, 2324, *Bur. Sci.* 3300 *Ramos*: Province of Tayabas, *Gregory* 89, *Whitford* 706, *For. Bur.* 6611 *Kobbe*, *Bur. Sci.* 2357 *Mearns*: Province of Camarines, *Ahern* 179, 290: Province of Albay, *Bur. Sci.* 6418 *Robinson*. MINDORO, *Merrill* 913, 2216, 2464, *McGregor* 157. Ticao, *For. Bur.* 1053, 2536 *Clark*. CEBU, *Barrow* 9. MINDANAO, Lake Lanao, *Mrs. Clemens* 278.

Native names: *Tal-lolong* (Il.); *Talulong* (Cag.); *Tortoraoc* (Zamb.); *Tangolon*, *Niogniogan*, *Tangolo* (Tag.); *Bonor*, *Tangolan* (Vis).

Widely distributed in the Philippines at low altitudes, and occasionally cultivated for ornamental purposes. India (cultivated), to Burma, southern China and Formosa, the Malay Peninsula and Archipelago to New Guinea; cultivated in other tropical countries.

LICHENES INSULARUM PHILIPPINARUM, I.

By E. A. WAINIO.
(Helsingfors, Finland.)

I DISCOLICHENES.

A. CYCLOCARPEAE.

Trib. 1. PARMELIEAE.

1. EUMITRIA Stirt.

Axis chondroideus thalli late tubulosus, stratum myelohyphicum, ex hyphis haud conglutinatis formatum, continens.

1. *E. endorhodina* Wain. sp. nov.

Strato gonidiali roseo et reactionibus thalli dignota. Thallus erectus, long. circ. 80 mm, rigidus, stramineo-glauescens, teres, apices et basin versus laevigatus, ceterum totus verruculis minutissimis (circ. 0.15–0.1 mm latis), apice stramineis, esorediatis, creberrimis instructis, sat increbre dichotome ramosus, ramis adventitiis spinulaeformibus, circ. 1–5 mm longis et 0.2 mm crassis ornatus. Stratum gonidiale crebre contextum, tenue, roseum, primum subalbidum, KHO intensius rubescens. Axis chondroideus tubulosus, KHO intense lutescens, stratum myelohyphicum laxissime contextum, KHO lutescens, continens.

Luzon, prov. Benguet, Pauai, *Bur. Sci.* 4543 p. p. *Mearns*, alt. 2100 m s. m. Ad corticem *Pini insularis* Endl. Ster.

2. *E. endochroa* Wain. sp. nov.

Var. *papillata* Wain.

Thallus verruculis esorediatis instructus. Strato gonidiali albido-stramineo a specie praecedente differt. Thallus erectus, long. circ. 90–130 mm, rigidus, glauco-stramineus, teres, apices et basin versus laevigatus, ceterum totus verruculis minutissimis (circ. 0.1 mm latis), apice stramineis, esorediatis, creberrimis instructus, increbre dichotome et partim sympodialiter ramosus, ramis adventitiis spinulaeformibus, circ. 2–12 mm longis, circ. 0.2 mm crassis ornatus, jodo non reagens. Stratum gonidiale

tenue, crebre contextum, albido-stramineum, KHO lutescens, dein aurantiaco-fulvescens. Axis chondroideus tubulosus, KHO parum lutescens, stratum myelohyphicum laxissime contextum, KHO leviter lutescens, continens. *E. trullifera* (Nyl.) Wain. (*Usnea* Nyl. apud Cromb., Lich. Chall. Exp. (1878) 224) strato gonidiali stramineo roseo-maculato ceterisque notis ab hac varietate secundum specimen orig. in herb. Nyl. differt.

Luzon, prov. Laguna, mons Banajao, *For. Bur.* 7991 p. p. Curran & Merritt: prov. Lepanto, mons Data, *Merrill* 4990 p. p., alt. 2100 m s. m. Ad truncos arborum. Ster.

Var. *farinosa* Wain.

Thallus verruculis demum soralia parvula formantibus, crebris instructus. Stratum gonidiale stramineum aut demum sulphureum, KHO leviter lutescens, dein aurantiaco-fulvescens. Axis chondroideus tubulosus, KHO parum lutescens, stratum myelohyphicum laxissime contextum, KHO leviter lutescens, continens. Apothecia circ. 4–5 mm lata, disco carneo-pallido, tenuiter pruinoso, margine spinuloso, spinulis numerosis, excipulo subtus laevigato. Hypothecium stramineum. Epithecium stramineum, granulosum. Sporae distichae, ellipsoideae, apicibus rotundatis, decolores, simplices, long. 0.008–0.009, crass. 0.005–0.007 mm. Asci jodo caerulescentes.

Luzon, prov. Laguna, mons Banajao, *For. Bur.* 7991 p. p. Curran & Merritt. Ad truncum arboris. Fert.

2. *USNEA* (Dill.) Pers.

1. *U. florida* (L.) Wain.

Var. *subcomosa* Wain. (Addit. Lich. Antill.)

Stratum myelohyphicum crebre contextum, KHO intense lutescens. Axis chondroideus crassitudine mediocris.

Luzon, prov. Lepanto, mons Data, *Merrill* 4905, alt. 2100 m s. m. In arboribus. Fert.

2. *U. perplexans* (Stirt.) Wain.

Stratum myelohyphicum crebre contextum, KHO lutescens, dein rubescens. Axis chondroideus crassitudine mediocris.

Luzon, prov. Benguet, Baguio, cum *For. Bur.* 15626 Curran. Ad Pinum insulare Endl. Ster.

3. *U. australis* Fr. (*U. cinchonarum* (Fée) Wain.)

Forma *subinermis* Wain. (étud. Lich. Brés. 1:7)

Thallus erectus, increbre dichotome ramosus, ramulis adventitiis parvis aut fere nullis, crebre verruculosus. Stratum myelohyphicum laxo contextum, KHO lutescens, dein rubescens. Axis chondroideus tenuis.

Luzon, prov. Benguet, Pauai, *Bur. Sci.* 4543 p. p. Mearns, alt. 2100 m s. m.: Prov. Laguna, mons Banajao. *For. Bur.* 7991 p. p. Curran & Merritt. Ster.

4. *U. pycnoclada* Wain. sp. nov.

Thallus fruticulosus, erectus, long. circ. 18–35 mm, sat mollis, stramineus aut demum partim pallido-stramineus, teres, apicem versus creberrime iteratim dichotome ramosus, ceterum minus crebre iteratim dichotome et sympodialiter ramosus, ramis primariis 1–0.5 mm crassis et maxima parte creberrime cartilagineo-verruculosis, verruculis angustissimis, ramis superioribus laevigatis, apices versus soraliis numerosis aut parvis instructus, ramis adventitiis nullis. Stratum myelohyphicum laxissime contextum, KHO non reagens. Axis chondroideus tenuis, neque KHO, nec jodo reagens.

Luzon, prov. Laguna, mons Banajao, cum *For. Bur.* 7999, 8000 *Curran & Merritt*.

5. *U. philippina* Wain. sp. nov.

Var. *primaria* Wain.

Stratum myelohyphicum KHO non reagens. Thallus pendulus, demum elongatus (200 mm excedens), parum rigidus, stramineus aut glaucescenti-stramineus, teres, increbre aut sat increbre iteratim dichotome ramosus, axillis vulgo patentissimis, ramis primariis 1.5–0.6 mm crassis, laevigatus, partim cortice increbre aut crebre annulato-diffracto, ramis adventitiis et sorediis destitutus. Stratum myelohyphicum bene evolutum, ex hyphis crebre contextis formatum, KHO non reagens. Axis chondroideus crassitudine mediocris (mesinus), KHO non reagens, jodo demum intense caerulescens.

Luzon, prov. Lepanto, mons Data, *Merrill* 4982, alt. 2100 m s. m. Ad *Pinum insularem* Endl. Ster.

Var. *Mearnsii* Wain.

Stratum myelohyphicum KHO lutescens. Thallus apicibus filiformibus, tenuioribus quam in var. *primaria*, ramis primariis 0.7–0.5 mm crassis. Axis chondroideus jodo distincte (at haud intense) caerulescens. Habitu haec species est similis *U. intercalari* Krempelh., at defectu sorediorum et reactionibus ab ea differens.

Luzon, prov. Benguet, Pauai, *Bur. Sci.* 4543 *Mearns*, alt. 2100 m s. m. Ad *Pinum insularem* Endl. Ster.

6. *U. trichodea* Ach.

U. ciliata (Müll. Arg.) Wain. *U. trichodea* var. *ciliata* Müll. Arg. Lich. Beitr. (Fl. 1875) n. 43, haud *Neuropogon melananthus* var. *ciliatus* Nyl. Lich. Nov. Zel. (1867) 245 (=var. *sphaecelata* R. Br.)

Thallus pendulus, demum elongatus, flexilis, stramineo-glauescens aut albido-glauescens, teres, sympodialiter et increbre dichotome ramosus, ramis primariis 0.7–0.3 mm crassis, laevigatus aut passim parce verruculis parvis instructus (aut in specimine orig. cortice demum annulato-diffracto), sorediis destitutus, ramis adventitiis circ. 1–18 mm longis,

squarrosis partim abundanter instructus. Stratum myelohyphicum ex hyphis crebre contextis formatum, KHO lutescens, dein mox rubescens, jodo non reagens. Axis chondroideus crassitudine mediocris (mesinus), jodo non reagens. Reactionibus cum specimine orig. congruens.

Luzon, prov. Batangas, *For. Bur.* 7812 *Curran & Merritt*. In ramis arborum. Ster.

Var. *rubiginosa* (Hepp).

U. longissima b. *rubiginosa* Hepp in Zolling. Syst. Verzeichn. (1854) 7; Mont. et v. d. Bosc. Lich. Jav. (1856) 2.

U. trichodea v. *rubiginosa* Müll. Arg. Lich. Beitr. (Fl. 1878) n. 84.

Thallus saepe crassior, facile rubescens. Thallus pendulus, demum elongatus, sat fragilis, stramineo-glaucescens, in humiditate facile rubescens, teres, sympodialiter et increbre dichotome ramosus, ramis primariis 1–0.3 mm crassis, laevigatus et passim parce verruculis parvis instructus et in ramis primariis cortice vulgo areolato aut annulato-diffracto, sorediis destitutus, ramis adventitiis circ. 3–15 mm longis, squarrosis abundanter instructus. Stratum myelohyphicum ex hyphis crebre contextis formatum, KHO lutescens, dein mox rubescens. Axis chondroideus crassitudine mediocris (mesinus), facile rubescens, jodo non reagens. Cum specimine, in Java a Kurz lecto, in herb. Nyl. (n. 36472) etiam reactionibus congruens.

Luzon, prov. Bataan, Lamao, *For. Bur.* 7530 *Curran*. In arbore. Ster.

7. *U. squarrosa* Wain. sp. nov.

Thallus pendulus, demum elongatus, sat flexilis aut leviter fragilis, stramineus aut glaucescenti-stramineus, teres, sympodialiter et increbre dichotome ramosus, ramis primariis 1–0.4 mm crassis, partim laevigatus, partim plus minusve increbre verruculosus, verruculis parvis et saepe parum prominentibus, circ. 0.001 mm latis, stramineis, in ramis primariis cortice vulgo annulato-diffracto, sorediis destitutus, ramis adventitiis circ. 1–22 mm longis, circ. 0.2–0.15 mm crassis, squarrosis abundanter instructus. Stratum myelohyphicum ex hyphis crebre contextis formatum, sat tenue, KHO lutescens, dein rubescens, jodo non reagens. Axis chondroideus sat crassus (pachynus), solidus aut interdum demum poro tenui medullam laxam continente instructus, jodo caeruleus. Apothecia lateralialia aut subterminalia, circ. 3–4 mm lata, disco livido-caesio aut carneo-pallido, vulgo bene pruinoso, margine spinulis numerosis aut paucis aut nullis ornato, excipulo subtus laevigato. Sporae 8-nae, ellipsoideae aut subgloboso-ellipsoideae, simplices, decolores, long. 0.008–0.009, crass. 0.005–0.008 mm. Habitu similis est *U. trichodeae* Ach., cujus thallus jodo non reagens et stratum myelohyphicum KHO haud distincte reagens secundum specimen orig. e Nova Scotia in herb. Ach.

MINDANAO. Castra Keithley prope lacum Lanao, *Mary Strong Clemens* 1308: prov. Zamboanga, Port. Banga, *For. Bur.* 9396 *Whitford & Hutchinson*. In arboribus. Fert.

8. *U. longissima* Ach.

Var. *typica* Wain.

Stratum myelohyphicum thalli KHO non reagens; axis chondroideus pachynus, jodo caerulescens.

LUZON, prov. Lepanto, mons Data, cum *Merrill 4944*, alt. 2100 m s. m.: prov. Benguet, Pauai, *Bur. Sci. Mearns*, alt. 2100 m s. m. In arboribus. Ster.

Var. *misamisensis* Wain.

Thallus paullo magis fragilis quam in f. *typica*. Stratum myelohyphicum KHO lutescens. Axis chondroideus jodo caerulescens. Apothecia circ. 2–0.7 mm lata, disco concavo aut plano, carneo-pallido, tenuiter pruinoso, margine ramulis numerosis ornato, excipulo subtus laevigato. Sporae 8-nae, ellipsoideae aut subgloboso-ellipsoideae, long. 0.008–0.009, crass. 0.005–0.006 mm.

MINDANAO, prov. Misamis, mons Malindang, *For. Bur. 4807 Mearns & Hutchinson*. LUZON, prov. Lepanto, mons Data, cum *Merrill 4944*, alt. 2100 m s. m. In arboribus. Fert.

9. *U. furcata* Wain. sp. nov.

Var. *communis* Wain.

Stratum myelohyphicum laxè contextum. Thallus pendulus, demum elongatus, flexilis aut sat mollis, stramineus aut stramineo-pallidus, teres, sat increbre iteratim dichotome et partim parceque sympodialiter ramosus, ramis primariis 1.5–0.5 mm crassis, apicibus filiformi-attenuatis vulgo elongatis, laevigatus, leviter nitidus, sorediis destitutus, ramis adventitiis nullis. Stratum myelohyphicum ex hyphis laxè contextis formatum, KHO lutescens, dein rubescens, jodo non reagens. Axis chondroideus tenuis (leptinus) jodo non reagens. Apothecia lateralialia aut subterminalia, 5.5–1.5 mm lata, disco carneo-pallido aut testaceo-livido, tenuiter stramineo-pruinoso, margine spinulis numerosissimis aut paucis instructo, excipulo subtus laevigato. Sporae 8-nae, distichae, simplices, decolores, ellipsoideae aut subgloboso-ellipsoideae, long. 0.008–0.011, crass. 0.006–0.008 mm. Hymenium jodo intense caerulescens. Ramificatione thalli et habitu similis est *U. dichotomae* Fr., quae secundum specimen n. 36452 in herb. Nyl. (ex herb. Deless.) thallo parce soredioso et KHO non reagentè ab ea differt. *U. fragilis* Wain. et *U. flexilis* Stirt. thallo sympodialiter ramoso ab ea distinguuntur.

LUZON, prov. Lepanto, mons Data, *Merrill 4990*, alt. 2100 m s. m.: prov. Benguet, Pauai, *Bur. Sci. 4543 p. p. Mearns*: prov. Tayabas, mons Banajao, *For. Bur. 7999 Curran & Merritt*: prov. Zambales, mons Tapulao, *For. Bur. 8167 Curran & Merritt*. NEGROS, mons Canlaon, *Banks s. n.* In arboribus. Fert.

Var. *marivelensis* Wain.

Stratum myelohyphicum partim laxè, partim crebre contextum, KHO lutescens, dein mox rubescens, jodo non reagens. Axis chondroideus tenuis, jodo non reagens. Thallus ramis primariis 2–0.2 mm crassis. *U. Vriesiana* Mont. et v. d. Bosch jam reactione thalli ab hac planta differt.

LUZON, prov. Bataan, mons Mariveles, *Merrill 3685*. In arbore. Fert.

3. OROPOGON Th. Fr.

1. *O. loxensis* (Fée) Th. Fr.

Forma *fuscescens* Wain.

Habitu et colore thalli *Alectoriae divergenti* (Ach.) similis. Thallus fuscescens, nitidus, poris parvis, subclausis rimaeformibusque, stratis corticalibus neque KHO, nec CaCl_2O_2 reagentibus, medulla laxissima et cavernosa KHO distincte lutescente. Thallus etiam in f. *isabellina* Wain. eodem modo reagens (h. e. in forma typica, thallo isabellino-pallescente instructa).

LUZON, prov. Lepanto, mons Data, cum Merrill 4944, alt. 2100 m s. m. In arboribus. Ster.

4. RAMALINA Ach.

1. *R. pollinaria* (Westr.) Ach.

Var. *insularis* Wain.

Subsimilis var. *intermediae* (Nyl.) et *R. scopariae* Wain., at thallo striis medullaribus parvis parvisque instructo. Thallus long. circ. 20–25 mm, crebre dichotome fastigiato-ramosus, ramis primariis 1–0.5 mm latis, apicibus sensim aut inaequaliter attenuatis, tenuibus, vulgo obtusis, soralis parvis apicem versus instructus, erectus, compressus, leviter longitrosus corrugatus aut abrupte subcanaliculatus, pallido-stramineus, leviter nitidus, cortice tenui et partim ferè semipellucidus. Stratum medullare KHO non reagens. Parum differt a specimine orig. *R. intermediae* (Del.) Nyl.

UBIAN, (Archipel. Sulu), Merrill 5405. In arbusto. Ster.

2. *R. gracilentia* Ach.

Var. *torulosa* Nyl. (*R. gracilentia* f. *torulosa* Nyl. Rec. Mon. Ramal. (1870) 20).

Secundum specimen orig. n. 37196 in herb. Nyl. thallus striis medullaribus stramineis, brevibus, saepe prominentibus crebre ornatus. Sporae fusiformi-oblongae, apicibus sat obtusis, long. 0.011–0.015, crass. 0.004–0.005 mm, observante Nyl.

Ad corticem arboris prope Manilam lecta a Gaudichaud. Fert.

3. *R. linearis* (Sw.) Müll. Arg.

In arboribus in monte, alt. 900 m s. m., in prov. Benguet, insula Luzon, lecta a Wallis (secundum specimen in herb. meo). Ster.

4. *R. subfraxinea* Nyl.

Thallus laciniis elongatis, canaliculatis, striis medullaribus oblongis et ellipsoideis, leviter aut parum prominentibus praesertim inferne ornatus, canaliculatus, medulla KHO non reagentem. Lacinae elongatae, long. usque ad 10 cm, statura sicut in var. *subcanaliculata* Nyl., at sporae rectae aut parce obliquae, apicibus obtusis, long. 0.10–0.013, crass. 0.004–0.005 mm.

In arboribus in insulis Philippinis secundum specimen a Llanos lectum in herb. meo. Fert.

5. *R. vittata* Nyl. l. c. 62.

Secundum specimen n. 36971 in herb. Nyl. in insulis Philippinensibus a *Cuming* lecta. Fert.

5. *CETRARIA* (Ach.) Th. Fr.

1. *C. straminea* Wain. sp. nov.

Thallus stramineus aut glaucescenti-stramineus et passim nigricanti-variegatus, leviter nitidus, laevigatus aut passim parcissime stigmatoideopunctatus, intus albus, irregulariter laciniatus lobatusque, laciniis circ. 2.5–5 mm latis, apice rotundatis, adpressus, apicibus saepe leviter adscendentibus, isidiis et sorediis destitutus, margine passim parce ciliato et pycnoconidangiiis sessilibus aut apicibus spinulorum affixis ornato, subtus nigricans, sat nitidus, pseudocyphellis albis, minutis, parum impressis, crebre punctatus, ceterum laevigatus, rhizinis parcissimis instructus, KHO superne non reagens, intus leviter lutescens, dein leviter rubescens, CaCl_2O_2 non reagens, his solutionibus unitis superne leviter lutescens, intus leviter rubescens. Statura thalli subsimilis *Parmeliae perlatae*. Herbario Nylanderii haec species deest.

LUZON, prov. Laguna, mons Banajao, *For. Bur.* 7988 *Curran & Merritt*. Ad truncum arboris. Ster.

6. *PARMELIA* (Ach.) De Not.

1. *P.* (sect. *Amphigymnia*) *perlata* Kraempel.

Thallus margine sorediosus, medulla KHO lutescente et, addito CaCl_2O_2 , rubescente.

MINDANAO, Castra Keithley prope lacum Lanao, *Clemens* 1300: prov. Zamboanga, *Copeland* "C". In rupe. Ster.

2. *P. Zollingeri* Hepp in Zolling. Syst. Verz. (1854) 6; Mont. & v. d. Bosch Lich. Jav. (1856) 16, (haud Hue Lich. Extra-Eur. 207).

P. saccatiloba Nyl. Fl. (1885) 608 (haud Tayl. in Hook. Journ. Bot. (1847) 174, secund. Müll. Arg. Lich. Beitr. n. 1353, et Hue l. c. 206).

Thallus sorediis et ciliis et isidiis destitutus, KHO superne et intus lutescens, CaCl_2O_2 non reagens, at his solutionibus unitis intus leviter rubescens. Coll. Zollinger n. 1241 secundum 4 specim. in herb. Nyl. cum speciminibus Philippinensibus congruens; medulla thalli in n. 35330 et 35546 KHO lutescens, in n. 35329 et 35331 primum lutescens, dein dilute fuscescenti-fulvescens.

LUZON, prov. Benguet, *For. Bur.* 15627 *Curran*: prov. Bataan, mons Mariveles, *Copeland* "M". MINDANAO, Castra Keithley prope lacum Lanao, *Clemens* 1314, 1328. CAMIGUIN (Babuyan), *Bur. Sci.* 4174 *Fénia*. Ad truncos arborum. Fert.

3. *P. nilgherrensis* Nyl.

Thallus margine ciliatus et sorediosus. Medulla neque KHO, nec CaCl_2O_2 reagens, at his reagentiis unitis rubescens.

LUZON, prov. Lepanto, mons Data, *Merrill* 4944, alt. 2100 m s. m.: prov. Benguet, Baguio, *For. Bur.* 15624 *Curran*. Ad truncos *Pinis insularis* Endl. Ster.

4. *P. corniculans* Nyl. Fl. (1885) 607.

Medulla thalli neque KHO, nec CaCl_2O_2 reagens, at his solutionibus unitis intense rubescens. Thallus isidiis et sorediis destitutus, margine bene ciliato. Apothecia perforata, margine plus minusve dentato ciliatoque, excipulo subtus laevigato aut rugoso.

Luzon, prov. Zambales, *For. Bur.* 8161 *Curran & Merritt*: prov. Benguet, mons Tonglon, *Bur. Sci.* 5489 *Ramos*. MINDORO, mons Halcon, *Merrill* 5738. Ad truncos arborum et in rupibus. Fert.

5. *P. Merrilli* Wain. sp. nov.

Thallus superne sordide albidus aut glaucescenti-albidus, praesertim centrum versus et ad margines etiam nigricanti-variegatus, intus albus, subtus totus ater aut raro partim ad ambitum pallidus, laciniis circ. 30–10 mm latis, irregulariter lobatis, lobis nonnullis apice rotundatis subintegrisque, ceterum margine profunde dentata et laciniata, dentibus lacinulisque saepe 1–10 mm longis, 0.3–0.8 (–1) mm latis, simplicibus aut furcatis, sat acutis aut apice angustato, planis aut superne convexis, sat laxae affixus, lobis saepe partim contortis at plus minusve imbricatis adscendentibusve, ceterum sat laevigatus, margine passim parce aut sat parce ciliato, ciliis 3–0.5 mm longis, nigris, simplicibus, sorediis et isidiis destitutus, subtus rhizinis brevibus, nigris passim parcissime instructus, KHO superne lutescens, intus leviter lutescens, CaCl_2O_2 non reagens, at his solutionibus unitis intus leviter rubescens. Apothecia mediocria, circ. 5–8 mm lata cupuliformia, subpedicellata aut sessilia, imperforata aut raro demum minute perforata, disco rufo aut testaceo-rufescente, nudo, opaco aut nitido, margine tenui, minute papilloso-denticulato aut parce lacinulato, haud ciliato, excipulo subtus sat laevigato aut leviter ruguloso. Hymenium circ. 0.1 mm crassum, ascis solis jodo caerulescentibus. Sporae 8-nae, distichae, simplices, decolores, ellipsoideae, long. 0.019–0.030, crass. 0.011–0.017 mm, membrana 0.003 mm crassa, exosporio et endosporio sat distincto, apicibus rotundatis. Conceptacula pycnoconidiorum thallo ambitum versus immersa, apice atro parum emergente. Pycnoconidia haud bene cognita (unum subbifusiforme, rectum, long. 0.007, crass. 0.0007 mm, inter sterigmata male evoluta vidi). Habitu similis est *P. disparili* Nyl., quae lacinulis subtus albidis et medulla CaCl_2O_2 non reagente et thallo ciliis destituto secundum specimen orig. n. 35103 in herb. Nyl. ab ea disingnuitur.

Luzon, prov. Zambales, *Bur. Sci.* 5156 *Ramos*, *For. Bur.* 8177 *Curran & Merritt*: prov. Benguet, mons Tonglon, *Bur. Sci.* 5493 *Ramos*. MINDORO, mons Halcon, *Merrill* 6163, alt. 2400 m s. m. Ad truncos. Fert.

6. *P. coralloidea* (Mey. & Flot.) Wain. Étud. Lich. Brés. 1: 33.

Thallus isidiosus, medulla alba, KHO non reagente, CaCl_2O_2 rubescente.

MINDANAO, Castra Keithley prope lacum Lanao, cum *Clemens* 1319. Ad truncum arboris. Ster.

7. *P. latissima* Fée var. *cristifera* (Tayl.) Hue.

Thallus ciliis destitutus, intus KHO lutescens, dein rubescens.

MINDANAO, prov. Davao, *Copeland* 1219. Ad truncum arboris. Ster.

8. *P. Clandelii* (Harm.) Wain. in Schmidt Fl. Koh Chang Lich. (1909) 337.

Var. *Clemensæ* Wain. var. nov.

Thallo subtus late denudato, passim rhizinis brevibus et papillis crebris instructo et margine parcissime ciliato a *P. Clandelii* differens et ad *P. latissimam* accedens. Thallus margine sorediosus, KHO superne lutescens, intus lutescens, dein rubescens. Apothecia cupuliformia, breviter pedicellata, imperforata, disco testaceo, nudo, margine subintegro aut crenato, ciliis destituto, excipulo subtus laevigato, soredioso (sporis haud juvenilibus). Pycnoconidia lageniformi-subfusiformia aut parcé subifusiformia, recta, long. 0.007–0.005, crass. 0.0007 mm.

MINDANAO, Castra Keithley prope lacum Lanao, *Clemens* 1319, 1314 p. p., 1328 p. p. Ad truncos arborum. Fert.

9. *P. (Irregularis) cetrata* Ach.

MINDANAO, prov. Davao, mons Apo, *Copeland* 1090 p. p., alt. 1800 m s. m. Ad truncum arboris. Ster.

10. *P. manilensis* Wain. sp. nov.

Thallus albidus aut glaucescenti-albidus, intus albus, inferne niger, laciniis circ. 8–3 mm latis, inaequaliter dilatatis, basi vulgo valde angustatis, irregulariter inaequaliterque lacinulatis, apice rotundato-dilatato aut anguloso-lacinulato angustatoque, adpresso aut leviter adscendente, sorediis et isidiis destitutus, vulgo sat laevigatus, cortice continuo aut centrum versus fortuito rimosus, subtus partim rugulosus, usque ad marginem rhizinis crebris, sat brevibus, 0.5–0.7 mm longis, nigris, saepe ramulosis, tenuibus instructus, KHO superne lutescens et demum fulvescens, intus non reagens, CaCl_2O_2 non reagens, his solutionibus unitis intus non reagens. Apothecia numerosa et partim crebra mediocria aut minora, circ. 3.5–2 mm lata, primum cupuliformia, dein applanata peltataque, basi bene constricta, sessilia, imperforata, disco rufo, nudo, nitido, margine sat tenui, diu involuto, subintegro aut leviter fisso, ciliis destituto, excipulo extus laevigato. Paraphyses increbre ramoso-connexae, tubulis tenuibus, membranis gelatinoso-incrassatis, ceterum indistincte limitatis, at apicibus rufescenti-clavatis distincte limitatis. Epitecium rufescens, gelatina cuticulari fere decolorare. Sporae 8-nae, distichae, simplices, decolores, ellipsoideae, apicibus rotundatis, membrana 0.001 mm crassa, long. 0.02–0.013, crass. 0.01–0.007 mm. Jodo asci soli caerulescentes. *P. macrocarpoides* Wain. apotheciis subpedicellatis et vulgo perforatis, *P. subtiliacea* Nyl. rhizinis parvis et thallo superne calcareo-glaucescente et *P. fecunda* Hue sporis minoribus ab hac specie differunt.

LUZON, prov. Benguet, mons Tonglon, *Bur. Sci.* 5432a Ramos. Ad saxa. Fert.

11. *P. Hookeri* Tayl. in Hook. Journ. Bot. (1847) 169; Wain. Cat. Welw. Afr. Pl. Lich. (1901) 400.

Thallus isidiosus, KHO superne lutescens, intus lutescens et demum rubescens, CaCl_2O_2 non reagens. *P. meiphora* Nyl. Lich. Guin. 45, thallo majore ab hac specie differt.

LUZON, prov. Benguet, Baguio, *For. Bur.* 15626 Curran. Ad truncum *Pini insularis* Endl. Ster.

12. *P.* (sect. *Sublinearis*) *americana* (Mey. & Flot.) Mont.; Wain. Lich. Nov. Rar. I, Hedwigia (1899) 122.

Thallus subtus margine fibrillosus, ceterum glaber, superne isidiosus, soreidiis destitutus, KHO superne lutescens, intus primum lutescens, dein rubescens.

LUZON, prov. Benguet, Baguio, *For. Bur.* 15625 Curran. Ad truncum *Pini insularis* Endl.; mons Tonglon, *Bur. Sci.* 5484 Ramos, in rupe. Ster.

13. *P. sorocheilla* Wain. Lich. Nov. Rar. I, Hedwigia (1899) 123.

Thallus subtus margine fibrillosus, ceterum subtus glaber, isidiis destitutus, partim in apice et parce etiam in margine laciniarum soraliis rotundatis instructus, KHO superne flavescens, intus primum lutescens, dein rubescens.

LUZON, prov. Lepanto, mons Data, *Merrill* 4945, alt. 2100 m s. m. Ad truncos *Pini insularis* Endl. Ster.

14. *P. subdissecta* Nyl. Fl. (1882) 452; Nyl. & Cromb. in Journ. Bot. (1882) 51.

Thallus albidus, adpressus, isidiis minutissimis passim parce instructus, soreidiis et ciliis destitutus crebre iteratim dichotome ramosus, laciniis sublinearibus, 1–0.3 mm latis, apicibus obtusis aut truncatis retusisve, KHO superne lutescens, intus non reagens, CaCl_2O_2 non reagens, at his solutionibus unitis intus rubescens. Apothecia peltata applanataque, adpressa, sessilia, disco rufo, nudo, nitido, plano aut leviter concavo, margine sat tenui, leviter crenulato, excipulo subtus laevigato, isidiis destituta. Hymenium 0.035–0.04 mm crassum, praesertim ascis jodo caerulescentibus. Epithecium testaceo-rufescens. Paraphyses crebre septatae, tubulis mediocribus, 0.002–0.0025 mm crassis, apice parum incrassatis, membranis parum gelatinoso-incrassatis. Sporae 8-nae, distichae, simplices, decolores, ellipsoideae, apicibus rotundatis, long. 0.005–0.01, crass. 0.003–0.0005 mm. *P. dissecta* Nyl. apotheciis vulgo cupuliformibus, excipulo isidiioso et sporis majoribus ab hac specie differt.

LUZON, prov. Benguet, Baguio, *For. Bur.* 15632 Curran. Ad truncos *Pini insularis* Endl. Fert.

15. *P.* (div. *Endoxantha*) *biformis* Wain. sp. nov.

Thallus stramineo-glauescens aut partim cinereo- aut pallido-glauescens, medulla flava aut straminea aut partim stramineo-albida, subtus nigricans aut ad ambitum anguste aut late pallidus vel castaneus, laciniis biformibus, aliis latis, latitudine usque ad 5 mm, sicut in *P. tiliacea*

rotundato-lobatis crenatisve, inaequaliter dilatatis, aliis angustis, circ. 0.3–0.7 mm latis, sicut in *P. laevigata* sublinearibus, crebre iteratim dichotome ramosis, apicibus truncatis aut obtusis, partim adpressus, partim apicibus recurvis adscendentibus, saepe etiam laciniis imbricatis, sat laevigatus, leviter nitidus aut opacus, isidiis et sorediis destitutus, subtus fere usque ad marginem rhizinis crebris, 1.5–0.5 mm longis, nigris, simplicibus aut parcius etiam leviter ramulosis, tenuibus instructus, KHO superne haud reagens aut leviter flavescens, intus lutescens et demum aurantiaco-rubescens (forma *pauaiensis*) aut aurantiaco-fulvescens (forma *dataensis*), partibus intus subalbidis haud reagentibus, CaCl_2O_2 non reagens. Apothecia minora aut parva, 2.5–0.7 mm lata, peltata applanataque, sessilia, tenuia, imperforata, disco rufo aut testaceo-rufescente, nudo, sat opaco, margine tenuissimo, subintegro aut leviter crenulato, excipulo extus laevigato, interdum pycnoconidangiis instructo. Hymenium circ. 0.05 mm crassum, jodo caerulescens aut partim ascis solis caerulescentibus. Epithecium testaceo-rufescens, gelatina cuticulari passim pallidiore. Paraphyses tubulis sat tenuibus, apice paullo crassioribus, membranis gelatinoso-incrassatis, usque ad apicem indistincte limitatis. Sporae 8-nae, distichae, simplices, decolores, ellipsoideae, apicibus rotundatis, membrana vix 0.001 mm crassa, long. 0.014–0.01, crass. 0.008–0.006 mm. *P. denegans* Nyl. Lich. Ceyl. (1900) 6, secundum specimen orig. n. 35129 in herb. Nyl. thallo sorediis et isidiis destituto et medulla straminea instructa, facie externa huic speciei omnino similis est, at secundum annotationem Nylanderi thallo KHO haud reagentem et sporis brevioribus ab ea differt. *P. endochlora* Leight. Lich. Ceyl. (1870) 140, secundum specimen orig. n. 35077 in herb. Nyl. item his est similis, at observante Nyl. tantum extus KHO reagens.

Forma *pauaiensis* Wain.

LUZON, prov. Benguet, Pauai, *Bur. Sci. 4434 Mearns*, alt. 2100 m s. m. Ad truncum arboris. Ster.

Forma *dataensis* Wain.

LUZON, prov. Lepanto, mons Data, *Merrill 4987*, alt. 2100 m s. m. Ad truncum arboris. Fert.

Trib. 2. STEREOCAULEAE.

1. STEREOCAULON Schreb.

1. *S. nesaeum* Nyl.

Var. *zeorina* Wain.

Perithecium ex hyphis radiantibus, pachydermaticis, conglutinatis formatum, semipellucidum, in margine anguste denudatum, ceterum amphithecio thallino, goudia continente, obductum. Pars intima axis chondroidei et partes exteriores pseudopodetiorum KHO lutescentes. Apothecia KHO lutescentia, hymenium et hypothecium KHO demum aurantiaco-rubescens. Amphithecium ex hyphis crassis, pachydermaticis, irregulariter contextis, aëre disjunctis aut partim in superficie excipuli

conglutinatis, et ex hyphis tenuibus leptodermaticis, gonidia obducentibus, formatum. Hypothecium pallidum, strato medullari ex hyphis irregulariter contextis, leptodermaticis, conglutinatis formato, impositum. Sporae aciculares, longissimae, spiraliter contortae, multiseptatae. Cephalodia sessilia, foveolato-rugosa, gonidia scytonemea, filamenta 0.01–0.013 mm crassa, cellulis 0.007–0.008 mm crassis, in serie simplice concatenatis formantia, parce continentia. Pycnoconidia aciculari-fusiformia, medio leviter incrassata, apicibus attenuatis tenuissimisque, leviter curvata, long. 0.008–0.01, crass. 0.0007–0.001 mm.

LUZON, prov. Benguet, mons Tonglon (Santo Tomas), *Elmer* 6544; Pauai, *Merrill* 4926, alt. 2100 m s. m.: prov. Lepanto, Balili, *Merrill* 4879: prov. Zambales, mons Pinatubo, *Bur. Sci.* 2577 *Fowworthy*. Ad saxa. Fert.

Var. *lecideoides* Wain.

Perithaecium primum amphithecio thallino obductum, demum late denudatum. Ceterum pseudopodetia et apothecia et eorum reactiones sicut in var. *zeorina*. Amphithecium thallinum apotheciorum demum saepe gonidiis destitutum. Hymenium et hypothecium KHO demum aurantiaco-rubrescentia.

LUZON, prov. Benguet, Baguio, *Merrill* 4866; mons Tonglon, *Bur. Sci.* 5477 *Ramos*: prov. Bataan, mons Mariveles, *Merrill* 3561. MINDANAO, prov. Misamis, mons Malindang, *For. Bur.* 4806 *Mearns & Hutchinson*. Ad saxa. Fert.

2. *S. graminosum* Schaer. in Moritzi Syst. Verz. Zolling. Jav. Pflanz. (1845–46) 127; Zolling. Syst. Verz. (1854) 6; Mont. & v. d. Bosch Lich. Jav. (1856) 28.

S. turgescens Nyl. Syn. Lich. 248; Lich. Ins. Guin. 43.

Pseudopodetia KHO neque superne nec intus reagentia, at verruculae phyllocladoideae KHO lutescentes. Apothecia lecideina, subtus fuscentia. In *S. alpina* Laur. verruculae phyllocladoideae majores et apothecia zeorina, subtus strato tomentoso, thallo concolore obducta. Etiam in *S. tomentosa* Laur. apothecia zeorina.

LUZON, prov. Zambales, mons Pinatubo, *Bur. Sci.* 2545 *Fowworthy*: prov. Laguna, mons Banajao, *For. Bur.* 7984 *Curran & Merritt*. Ad saxa. Fert.

3. *S. arbuscula* Nyl. Prodr. Fl. Nov. Gran. ed. 2 (Ann. Sc. Nat. Bot. IV 19 (1863) 12).

S. nanum var. *arbuscula* Nyl. Enum. Gen. Lich. (1857) 97.

Leprocaulon arbuscula Nyl. Lich. Ins. Guin. 8.

Ramuli phyllocladoidei applanati, KHO non reagentes. Pseudopodetia basi emorientia et apice postea adhuc diu accrescentia.

LUZON, prov. Lepanto, mons Data, *Merrill* 4958, alt. 2100 m s. m. Supra muscos in rupe. Ster.

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